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THE LOWER REACHES OF THE ORANGE RIVER

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OF the many wild spots it has been my lot to visit during years of wandering in South Africa, none have appealed to my imagination to such an extent as the maze of pathless and intricate mountains through which the Orange River, after its giant plunge over the Great Falls of Aughrabies, winds its solitary and tortuous way to the sea. Nearly 300 miles it winds and zigzags, most of it through desolate and uninhabited country, much of it through deep-worn narrow gorges, between precipitous walls of rock, in many places unapproachable, and the last 150 miles practically unknown. This particular portion is known as the Richtersveld, where range after range of fantastic-shaped mountains have barred the river's passage to the sea, turning it back upon its course, and forcing it to describe a huge semicircle before it emerges from them into the more open but desolate country at Zendling's Drift, within 50 miles or so of the Atlantic. It is my good fortune to have taken several expeditions into these mountains, and to have at various times traversed practically the whole of the river-banks from the Great Falls of the Orange to the sea. These visits, several of them of many months' duration, have covered a period of some twelve years, my first trip having been in 1908, when the discovery of diamonds in the sands of Lüderitzbucht and in German territory immediately north of the Orange had led to some interest being taken in the region, and the latest having extended from January 1920 until a few months back.

For the purposes of this article, however, I shall treat the various expeditions as one, and endeavour to describe the river and the adjoining country from above the Great Falls to the sea.

At the time of my first visit the falls were very much more difficult of access than they are to-day, some 200 miles of desolate sandy country having to be traversed to reach them from Prieska, the terminus of the branch line coming from De Aar and the main line from Capetown to the north. But the war brought the linking up of the Cape Government railways with those of the recently conquered territory lately known as German South-West Africa, to-day a mandatory of the Union; and the new line

through Upington runs within a moderate distance of the falls. From Upington, where the river is spanned by a fine bridge, the usual route is along the north bank, downstream, passing through the verdant and productive lands of Keimoes, lands irrigated by gravitation furrows, and where oranges, grapes, deciduous fruits, vegetables, and cereals grow in astonishing profusion—for the silt brought down by the frequent floods of the Orange is equal in fertility to that of the Nile. These verdant stretches along the banks are the more remarkable from the fact that the outlying dunes of the southern Kalahari Desert run down to their very margin, and much of the "road" leads over these giant waves of soft red sand. Sixty miles of this road, and these smiling green river "lands," and Kakamas North Furrow is reached. Kakamas itself, the Labour colony founded by the Dutch Reformed Church, lies on the opposite (south) bank, and this article is all too short to make more than a passing reference to this remote and almost isolated community of some 3000 odd "poor whites." The settlement, which stretches for several miles along the banks, is communal; it is notable for the number of its churches, the fertility of its irrigated lands, and—strangely enough—for its poverty. At the time of my last visit, in 1914, the nearest doctor to this rapidly growing settlement was at Upington, fully two days distant—I say "days," for in this land of bad roads and sand-dunes it is time, and not mileage, that counts.

To return to the north bank, along which runs the route to the falls. Here, at a place called Krantz Kop, there is a well-stocked store, from which travellers usually make a start for Aughrabies; for this is not only the last store, but practically the last dwelling on the north bank before reaching the tiny police-post at Stolzenfels, many days' journey downstream and in what was till recently German territory.

From Krantz Kop the roads become every mile more atrocious, and after a few hours give place to the merest track. This leads away from the river, crossing granite and dolerite kopjes, and ridges where every step tempts a smash-up, and leading directly towards a formidable barrier of abrupt peaks. The surroundings become wilder at every step, and the strange shapes of the peculiar-looking vegetation, "Koker-boomen" (*Aloe dichotoma*), thorny candelabra euphorbiæ, and a variety of "melk-bosch" exactly like gigantic asparagus, lend a weird aspect to the landscape. The prevailing granite, pinkish and speckled with an abundance of rock garnet, is broken by a profusion of quartz reefs and outcrops, which as the late German border is approached gradually change from pure white through every shade of pink to the most beautiful of rose quartz, which in numerous instances becomes amethystine, and ranges from pale heliotrope to deep purple in colour. Many of these reefs are full of large crystals of jet-black tourmaline, beautifully faceted, and often as thick as one's wrist. Many of the giant boulders of granite are covered with lichens of extremely vivid colours, ranging from bright yellow to vivid scarlet, and across the

river runs a long range of peaks outlined like cockscomb, and noticeable even in this land of violent colour contrasts, for they are jet-black, as though made of coal. There is no sign of life or habitation, for with the exception of the small farmhouse at "Omdraai" (Turn back!) the whole country is uninhabited, except for a few nomad Bastards and Hottentots.

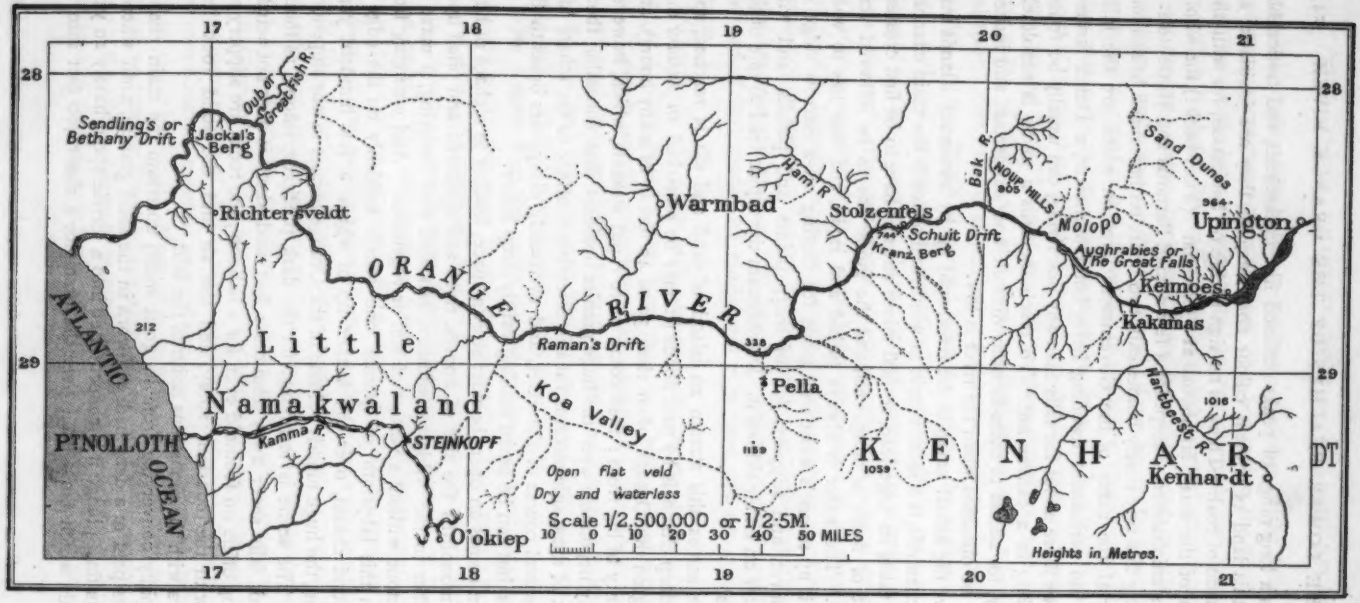
Passing this tiny lonely homestead, two hours on horseback brings one to Waterval, the name of the Government farm on which are the falls. There is no permanent dwelling here, but Oberholzer, a Dutch farmer, who knows more about the falls than any one living, can usually be found there, living in a canvas hut. To reach the falls a guide is absolutely necessary, for access to them is both difficult and dangerous, and indeed can only be obtained when the river is low.

Above the actual cataract the river, split up by numerous islands into various channels, is almost a mile in width, and to reach the main channel, where it takes its huge leap, several minor streams have to be first crossed. The first of these is dangerous, and the guide has to be followed very carefully. The water is always turbid and rapid, and one has to wade through it up to one's waist and grope for footing on a narrow ridge of rock, uneven and slippery, full of sharp points and pitfalls, and with deep water on either side of it. Downstream the rapids lead to one of the side falls.

Once across this stream an island of sand and silt is reached, split up into deep channels by past floods (it may be remarked *en passant* that at Upington the Orange often rises 30 or 40 feet in as many hours), and with plenty of big trees; then come more rapid streams, which, however, are easily negotiable over the huge granite boulders that encumber them. The last of these side streams runs in direction contrary to the others and to the general course of the river, and eventually disappears beneath the boulders, but can be heard rushing swiftly deep below.

Then comes an open boulder-strewn space, leading to a chaos of huge granite monoliths the size of houses, riven and shattered and piled upon each other in the wildest confusion, balanced and tottering, a maze of barren stone without a vestige of soil or vegetation. And emerging from a rift in this labyrinth of granite one stands suddenly on the edge of a profound chasm, over the farther lip of which, a few hundred yards upstream, the huge muddy volume of the Orange hurtles in one stupendous spout. The scene is terrifying, for the dark precipice, smooth as though chiselled, falls sheer away from one's feet, and where it does not actually overhang offers no foothold even for a baboon; the rocks are slippery and slimy with the constant spray, and the air and the solid rock itself trembles with the monstrous noise of the falls.

Rapidly converging from its great width upstream the main channel becomes pent in a deep bed, self-worn in the solid granite, until where it takes its final plunge it is concentrated into a terrific spout barely 20 yards in width, which hurls itself over the precipice a sheer 400 feet into the



Sketch-map of the Orange River from the Great Falls to the sea

CROSSING THE FIRST SIDE STREAM ABOVE THE GREAT FALLS

BOULDER-STREWN BED OF SIDE STREAM ABOVE THE GREAT FALLS

RAVINE ERODED IN GRANITE LEADING TO THE LOWER ORANGE RIVER

THE GORGE BELOW THE GREAT FALLS

GORGE IN THE RICHTERSVELD MOUNTAINS

gloomy abyss below. And with the plunge it practically disappears into the unknown, for many miles penned in a gloomy canyon, quite unapproachable and scarce to be glimpsed till it emerges into a slightly wider bed close to the border of what was recently German South-West Africa.

Higher than the Victoria Falls, and more than double the height of Niagara, the Great Falls of the Orange lack the spectacular beauty of either of its famous rivals. Impressive they are, but the impression they leave is rather one of terror than of pleasure, of awe rather than of beauty. On all sides there is nothing but riven, shattered rock, sheer precipice, and giant buttress: the vegetation of the side streams is hidden by the chaos of rocks near the brink of the canyon, and the scene is one of sheer desolation. This absence of vegetation and of life makes it additionally hard to realize the stupendous height of the main fall; the enormous smooth cliff opposite, the giant boulders, all confusing one's sense of proportion.

Discovered by the traveller George Thompson in 1824, they were named by him the Falls of King George, but are generally known as the Great Falls of the Orange; whilst to the writer's way of thinking their native name of Aughrabies is far more fitting than either of the others.

Some day, when civilization shall have spread so far, there will, of course, be safe bridges over the side channels, and mankind will be given an opportunity of seeing what no man yet can possibly have seen at close quarters and lived: the Orange River, in flood, filling not only its self-worn channel, but spreading all over the lip of that nightmare of an abyss in an appalling maëlstrom. Downstream from the falls it is impossible to follow the bank of the river, a native trail, cutting through terribly broken country away from the river, being the only means by which it can again be approached after it emerges from the gorge below the falls.

Thus far, in spite of the roughness of the track, that wonderful vehicle a Cape cart can be brought, but at Wag Brand, half a day's rough travelling below the falls, where the river is again reached, even this means of transport has to be abandoned. The track, which has been leading for ever downwards, is here penned in a narrow defile flanked by abrupt peaks. Further progress is barred by the swift river, and the only possible way downstream is around and along the almost precipitous flanks of the mountains, with no path, and with the swirling river immediately beneath. Usually there are a few Hottentots to be found at Wag Brand, and the traveller's belongings—if he cannot carry them himself—have to be carried by them if he wishes to proceed farther downstream.

For some distance the only path is treacherous, smooth, waterworn granite, sloping steeply into the rapid muddy current below; at times it widens into a belt of thick and tangled wood, full of grey monkeys and from which "pheasant" and guinea-fowl can be heard calling. Still one is penned in between the mountains, and eventually all way is barred by

a formidable peak rising sheer from the water. The way leads over the inland flank of this, and once over this ridge, the country, for a few miles at least, is no longer pent between formidable walls of rock. On the opposite bank there is a red mountain, flat-topped and striking looking even in this land of strange-looking mountains. It is known as Zee-coe-steek (Hippo's Kick!), and is the highest point in the Kenhardt district; but beyond this little is known of it, for the southern bank in its vicinity is almost as unknown and deserted as the wild and unsurveyed Noup Hills on the north bank, the "path" through which I am endeavouring to describe. Here, in the very broken but more open country mentioned, is the mouth of the Molopo, the ancient and long-dry river that at one time ran through what is now the Kalahari Desert, and whose course can still be traced for nearly 1000 miles to Ramathlabama Spruit, near Mafeking. Its junction with the Orange is choked with giant sand-dunes, through which usually but the tiniest trickle of water finds a way. Here, shut off by days of difficult trekking from any neighbours in any direction, there are a few Hottentots, refugees from German territory, who fled there at the time of the Hottentot war in 1903, and who have scarcely seen a white man a year since that time. When first I saw them they were in mortal fear lest we should prove Germans, and even after they learned that we were British and that they had nothing to fear from us, they were extremely reluctant to act as guides into the regions stretching westward through the wild Noup Hills to the German Border, with its possibilities of German patrols.

The comparatively open country at the junction of the Molopo with the Orange extends only for a mile or two, and northwards the Molopo bed can be seen narrowing into a deep and precipitous gorge. Continuing westward downstream along the Orange the mountains again converge and pen in the river. These mountains are split up into numerous deep narrow ravines, leading deviously and very gradually inland and upwards to the level of the flat country through which the Orange has through the ages worn so deep a bed. Most of the mountains are table-topped, and their flat summits are crowned with whole forests of the strange-looking Koker-boom, whilst the occcasional "spitz kop" (sugar-loaf mountain) which forms such a contrast to the table-topped variety, and which is equally characteristic of the region, is in reality only the result of more advanced stages of the same denudation.

In the lower levels near the present bed of the river this denudation has exposed much of the intrusive granites and dolerites, and the result has been the production of a country of the most rugged description, very difficult and dangerous to traverse. A day farther downstream and the ravine of the long-dead Bak River is reached, a deep ravine worn in the living granite, showing where once a mighty river joined the Orange from the now waterless desert stretches of the north. This river-bed, winding between steep mountain ranges, shows traces of extraordinary erosion for

hundreds of feet up the granite slopes, the actual bed being so smoothly carved and polished in the hard rock as to make it difficult to traverse even on foot.

This ravine is almost exactly on the 20th degree of east longitude, and as its course runs roughly north and south, some of the international beacons (which extend for hundreds of miles at irregular intervals due north through the desert to the Caprivi belt) stand in the centre of the actual river-bed, and the western bank of the dry river is generally considered the beginning of German South-West Africa. Before the war a German police patrol from Stolzenfels occasionally visited the Bak River, but very rarely and with difficulty, as the mountains are extremely difficult to traverse even on foot, and the region is thirst-ridden and quite uninhabited. Leopards abound in the ravines, and the native guides—when they can be obtained at all—fear them greatly.

Downstream, and now in what was till recently German territory, the mountains rise higher and higher—or rather the Orange and its dead tributaries have eaten deeper into them. To follow the actual bed becomes impossible, the slopes being almost precipitous, and the only way being over the high flat-topped mountains. These are traversed in all directions by deeply eroded gorges, which entail long détours to negotiate, and although the Orange may be in full view most of the time one is crossing these difficult hills, it is so hard of access that the unwary traveller may well die of thirst in full view of it. Here and there the peaks recede somewhat from the bed of the river, and then the narrow stretches of silt are clothed with dense vegetation. The mountains once crossed, a lonely habitation is again reached, at a little police post at Stolzenfels. More mountains, interspersed now with wider stretches of open country covered with "toa" (Bushman grass), and the river becomes more approachable. At Scuits Drift, as the name implies, there is a drift or ford where roads cross from British to German territory from what is generally known as "Little Bushmanland."

Lower down, and passing through similar rugged and very sparsely inhabited country, there stands near the British bank the little mission station of Pella, where the Catholic fathers have done splendid work with the wretchedly poor Hottentots of the vicinity. Fine gardens, beautiful vineyards, luxuriant vegetation, show what can be done with the wonderful silt of the Orange and its lateral valleys, whilst in the mission itself the natives are taught a variety of useful trades. The vicinity of the settlement is extremely rich in minerals; indications of copper are to be seen on all sides, and many mineral leases have been taken out in the vicinity, but the great distance from the railway has so far prevented any attempt at working them.

Raman's Drift, the next inhabited spot downstream, was prior to the war a police post of great importance, for through it leads the main transport road from the Cape Copper Company's little railway at Stein-

kopf, Namakwaland, to Warmbad, an important town some days' trek inland in the old German territory. During the Hottentot rebellion in the latter country in 1902–3 this road was greatly used, much of the German supplies being landed at Port Nolloth, Namakwaland, brought up to Steinkopf by the private railway already referred to, and thence transported by tedious ox-waggon—or even more tedious donkeys—through the Drift to the German base. In the latter part of 1914, and in 1915 during the invasion by the Union troops of German Territory, this route was again the scene of extremely busy transport, and we had an important supply base there; but with the linking up of the main South African Railway system with that of the late German system from Prieska through Upington, Nakob, and Kalkfontein, the old waggon route has ceased to be of any importance, and is practically deserted.

Just below Raman's Drift is Goodhouse, a farm which is a shining example again of what energy and capital can do with Orange river silt, combined with irrigation and the wonderful sunshine of Namaqualand. For here are grown fabulous crops of oranges, lemons, grapes, and other fruits, whilst lucerne (much used as fodder all over South Africa) yields no less than eight or nine crops per annum. The fertility of this and similar spots is altogether astounding, and when the proposed railways come within a reasonable distance of the region it cannot fail to become one of great prosperity.

With this beautifully cultivated farm, civilization, or even habitation along or near the river comes to an end, the lower reaches for fully 150 miles being uninhabited except by a few wandering Hottentots. For here the vast granite ranges of Namakwaland that run almost north and south, and form as it were the backbone of the country and of the adjacent territory to the north, turn back the Orange on its way westward to the sea, throwing it north, and in places even eastward, in the big semicircle referred to in the opening part of this article, the wilder parts of which are known as Richtersveldt.

Journeying along the banks of the river is here in many places even more difficult than in the Noup Hills already described. The mountains, where not of granite, are of quartzite and conglomerate interbedded and tilted at an awkward angle, or of schist so metamorphosed as to crumble to the touch—the latter affording most treacherous hand or foothold over the slopes and precipices which have to be crossed to penetrate the country. There are no roads whatever, a few bridle paths, or game paths known only to the natives, being the only routes. The region is again almost waterless; the river is in parts unapproachable for distances which, although trivial on the map, take several days of hard climbing and scrambling to traverse, and an accident, however trivial, may mean death from thirst. Indeed, thirst, and the anxiety as to where and when water will again be found, is ever present, and overshadows all other considerations.

Whenever possible I have followed the actual river-banks around this semicircle, in places, where the peaks recede from the water, having to hew a path through a tangle of virgin forest and undergrowth. The actual margin of the river is usually overhung with a beautiful, vividly green species of weeping willow, the huge trunks of which have rotted and fallen over each other through the ages that they have remained undisturbed; there are also several varieties of thorny acacias; high, graceful "cameel doorns" 40 or 50 feet in height, covered with little yellow blossoms that scent the air with the perfume of English cowslips; big black-barked trees known as "zwaart beis," beautifully foliaged "haak-doorn," bastard ebony, and a host of other trees and bushes. Here and there there are stretches of bright green turf, bird and animal life is plentiful, and altogether these pleasant stretches are very beautiful—the more so by contrast to the barren wilderness of scorched rock stretching for many days' journey on either hand. The river itself, where the mountains allow of it, is generally from 100 to 300 yards in width; there are many long stretches of 4 or 5 miles quite of the latter dimensions, and they are in some parts of great depth. Some of the holes, plumbed with a fishing-line by myself, have shown 70 or 80 feet of water at the river's normal height; and the long stretch opposite my last camp at Zendling's Drift, which I was able to sound systematically from a boat made on the spot, showed for miles an average depth of 25 feet on a width of about 300 yards. Occasionally these calm, solitary, and silent stretches are broken by noisy rapids, some with sufficient volume and current to provide enormous turbine power—if the country is ever opened up. At the apex of the semicircle, and at one of its wildest and most difficult parts, the Great Fish River, which almost bisects the late German Territory from north to south, joins the Orange. Usually almost dry, this once big river, which in the past has had a volume as great as that of the Orange, and whose bed lies in a similar series of deep ravines, is even to-day subject to periodical floods, and at times a huge volume of flood water pours down it into the Orange. At its confluence with the latter the wide mouth, like that of the Molopo, is greatly choked with sand, and the small densely wooded islands in the vicinity are the favourite haunt of the few hippo still to be found in these rivers.

Below the Great Fish, a two days' arduous journey brings one clear of the mountains at a triangular-shaped piece of open country opposite Zendling's Drift. But this journey is of great hazard; in places the only route lies for miles along the steep slope of the mountains, along the lower part of which soft sand has piled itself up at a very steep angle. This slips down bodily towards the swirling water as one walks, and constant movement is necessary to save one from being swept into the water in a miniature avalanche of sand. In other parts huge dolerite dykes bisect the river, and their highly polished flanks are so slippery that they are barely negotiable with rubber-soled boots, or by the naked feet of the natives.

At Zwaart Poort, near Zendling's Drift, the river at length begins to emerge into more open country, as the mountains recede from it for several miles. In this vicinity, comparatively recent (geologically speaking) volcanic action is very noticeable; several of the mountains are cup-shaped craters, though long since extinct, and the foothills near them are a horrible desolation of black lava, pumice, basalt, and scoriæ, in which nothing grows. Under these hills, and between them and the river, are some extraordinary gravel terraces of huge extent, in places from 200 to 300 feet in height, and consisting of innumerable layers of gravel. The surface of these terraces is an extraordinary sight, for most of the pebbles are agates, jaspers, chalcedonies, sards, and other semi-precious stones usually associated with the diamond, and all so sand-polished, so oxidized by the impregnation of iron, which abounds in the vicinity, that the whole appears like a polished mosaic.

A road here at length penetrates the mountains from the outer world: this leads from Port Nolloth to Zendling's Drift, where on the north bank the Germans had a fine police post, long since abandoned. This drift, no longer used—and in fact no longer in existence, for the river has changed its bed since then—was at one time a recognized route between northern Klein Namakwaland and Damaraland; and here Sir James Edward Alexander, one of the first Englishmen to visit and describe the country, crossed into Damaraland in 1837. His book, published in 1838, and entitled 'Expedition of Discovery into the Interior of Africa,' describes the route in question, and gives a good deal of quaint and accurate information of a good deal of the region. The rare traveller of to-day who wishes to reach Zendling's Drift has to trek laboriously by ox-waggon from Port Nolloth, some 80 or 90 miles distant only, but so difficult is the road, so heavy the sand of the coastal belt, and so precarious the water-holes *en route*, that the journey usually takes five days or more; and my monthly store waggon during my last trip there, when I stayed from January to June at the drift, scarcely ever did the journey under seven days.

Except for a few prospectors, no one ever goes into the country. Prospectors are lured there by the wonderful mineral wealth that abounds on every hand, but which difficulty of transport has so far kept from being exploited.

The few natives are nominally Hottentots, though many of them are of very diverse mixed breeds. For some sixty or seventy years ago this region formed a sort of native Alsatia, to which refugees from all sorts of tribes fled for refuge, and they, intermarrying with the native Hottentots, have left a strange hybrid race behind them. Still, the majority are Hottentots, and all speak the click language of that race. They are nominally members of the Rhenish Mission at Steinkopf, many days' journey away, and they had a tiny stone-built chapel in the mountains of Richtersveldt, about two days' journey from the drift. But the native

missionary died some years ago, and his place has never been filled. They are wretchedly poor, and lazy and thriftless to a degree, living (or rather half starving) on the milk of their goats, and making no effort whatever to till the soil or to try to do anything with the natural possibilities surrounding them. They are very primitive, and, though living mostly by the river, have never made a boat or canoe. Instead, they cross the river by a curious swimming-log, made from a long log of dry willow, into which a peg is driven to give them a grip. Astride this, and paddling with one hand, men, women, and quite small children cross the wide river even in flood-time. These floods, to which I have already alluded, at times swell the river to an enormous extent, and in February last it rose nearly 100 feet just below where it emerged from the mountains, and for days submerged even the highest trees. Near the drift itself it was for several days nearly half a mile in width, the swirling flood of muddy water carrying along in its centre an endless line of big dead trees; and the pity of it is, that in a land where water is a precious commodity, this huge flood benefits no one. Just below the drift a long hog-backed mountain known as Jackals Berg abuts upon the river, and makes travelling along it again dangerous. This mountain is remarkable for a huge deposit of iron ore, hæmatite of very high grade forming a big spur of it, and a fine reef of it running for many miles towards the sea.

A day's trek brings one to open country, the last 30 miles or so of the river running between undulating bush-clad country, most of it granite débris from the mountains I have described. Within a few miles of the sea one comes at length again upon a tiny habitation; for here, at a place called Groot Derm, there is a little homestead belonging to a farmer named Louw, a sheep and horse breeder, who at one time bred horses extensively for the Germans. There was also a tiny German police-post on the north bank, but this again is deserted, and his nearest neighbours to-day are many days' trek in any direction.

The actual mouth of the river itself is a series of sand-flats and sluggish channels, miles in width, covered with a multitude of flamingo and other wildfowl, closed by a bar of sand against which the big Atlantic breakers thunder incessantly. There is no post or settlement here of any kind, and the whole coast-line to Port Nolloth, two days' long journey south, is as lonely and deserted as when Bartholomew Dias landed here—at Cape Voltas, about 5 miles from the mouth of the Orange—in 1487.

The development of the region can take place only when the linking up of the Cape Government Railway through Namakwaland with the Cape Copper Company's private line at Ookiep shall have been accomplished. At present the railhead in that direction is at Klaver, a good 200 miles from Ookiep, but the project has long been mooted and much of the route surveyed. The natural extension to this route would be from Steinkopf, Namakwaland, to Warmbad, in the new Protectorate, over the old transport route already referred to, and crossing the Orange at

Raman's Drift. This would tap much of the country east of the Richtersveldt mountains, and here there is promise of great development in irrigated lands, similar to those at Goodhouse, whose wonderful crops have already been touched upon. Oranges and deciduous fruits thrive and yield abundant profit, even to-day, when transport is most difficult and costly. Except for the precarious rainfall the adjacent country is exceptionally good for stock raising, and with the advent of a railway great developments may be expected in this direction.

Westward, in the Richtersveldt region, the problem of transport is more difficult, and the proposed line would do little to open up this country. Its many mineral deposits, however, and the fact of the abundant water of the Orange traversing it, are bound eventually to lead to the making of roads from the present Cape Copper Company's railway, some 15 miles from Port Nolloth, to the river at Zendling's Drift, and a particularly valuable discovery of minerals might lead to a railway following the same route. Irrigation schemes along the river would be bound to follow, and these would be an end to the anomaly of this fine body of water running to waste in a land where water is the most precious of commodities.

Before the paper the PRESIDENT, after recounting the progress of arrangements for the Mount Everest Expedition, said: The lecturer to-night is Mr. Cornell, who has spent more than twenty years of his life exploring in South Africa and along the course of the Orange River; this evening he will give us an account of his experiences in an almost unknown country.

Mr. F. C. Cornell then read the paper printed above.

After the paper the PRESIDENT said: I am afraid I took up too much time at the beginning of the evening, so that there is not time now for a discussion, but I think you would like to express to the lecturer our very warm thanks for the attractive manner in which he has given us an account of the wonderful country through which he has passed. I shall recommend him to the Alpine Club for Mount Everest! I am sure if we tell him there are diamonds on the top of Mount Everest he will find his way up. I do not think these diamond-seekers mind particularly if they find the diamonds or not. What they like is the adventure and seeing wonderful countries, and the fine free life they lead. It is fortunate that the lecturer did bring home his photographs, because unless he had brought them we might have thought he was indulging in "Travellers' Tales." I have been in some pretty odd parts of the world myself—in the Gobi Desert, the Zungarian Desert, and in that part of the Himalaya, the Karakoram Pass, which travellers describe as the "valley of the shadow of death," but I must say that in all my travels I have never come across so grotesque and chaotic a country as we have seen this evening. It gives us an idea of what this Earth must have been like in those far-away days before vegetation had appeared in any part of the world. Our adventurous lecturer can give us an idea of what the Earth in its primitive condition was like.

KOKER BOOM—*ALOE DICHOTOMA*—ON THE PLATEAU ABOVE THE RIVER

SMOOTH GRANITE BED OF THE DRY BAK RIVER

ZENDLING'S DRIFT AND MITRE MOUNTAIN

STEEP BANK OF THE LOWER ORANGE OPPOSITE MITRE MOUNTAIN

MUD CRACKING ON SUBSIDENCE OF FLOOD: LOWER ORANGE RIVER: MITRE MOUNTAIN IN DISTANCE

THE HISTORY OF THE CHRONOMETER

Lieut.-Commander Rupert T. Gould, R.N.

Read at the Afternoon Meeting of the Society, 13 *December* 1920.

THE history of the marine chronometer, from its early beginnings to its present form, covers a period of about two hundred years, and I cannot hope, in the time at my disposal, to give you more than a rough sketch of the steps by which it was developed, and of the lives and work of the small body of men who were responsible for that development.

The chronometer came into existence as a particular solution—and, up to the present, the best solution—of the problem of finding longitude at sea. This problem is at least as old as the fifteenth century, when navigators began to make long sea voyages and consequently to get out of sight of land. They soon discovered that to find their latitude was a comparatively simple affair, but that their longitude was a matter of guesswork, and it was over two hundred and fifty years before a general method of finding it, by any other means than "dead reckoning," was discovered. Several theoretically correct methods were proposed, but the practical difficulties in the way of executing them proved, for a long while, insuperable.

The method of combining astronomical observations with a standard of time carried by the observer is, of course, that employed to-day. The local time of the ship's position is found by observation, and the Greenwich time obtained from the chronometer, allowance being made for its rate of gain or loss. The difference gives the ship's longitude.

Although proposed by Gemma Frisius in 1530, this method remained dormant for some two hundred and fifty years, since no machine could be made to keep sufficiently accurate time at sea. As a matter of fact, the accuracy required, which excludes errors of more than a few seconds in twenty-four hours, was not reached, even in astronomical clocks on shore, for nearly two centuries. Consequently sailors continued to depend for their longitude upon "dead reckoning," which simply means keeping as accurate an account as possible of the ship's courses steered and distances logged, and so calculating her change of longitude from her last observed position. This method, at the best of times, was subject to errors of all kinds—unknown compass errors, errors in logging, clerical errors, currents, allowance for leeway, etc., and it is not surprising that ships were often hopelessly out in their longitudes, and that in consequence shipwrecks were frequent. Two good examples of the defect of longitude by dead reckoning are to be found in the narrative of Anson's famous voyage. In 1741 he spent over a month endeavouring to round Cape Horn to the westward, and having, by his reckoning, made good enough westing to place him 10° clear of the most western point of Tierra del Fuego, stood to the north, only to sight land right ahead and to find that owing to an unsuspected

easterly set he was still on the eastern side of the cape. Again, after rounding the Horn and parting company with his squadron, scurvy broke out aboard the *Centurion*, and Anson, with his men dying like flies, ran to the northward, hoping to make the island of Juan Fernandez, to re-fit. In the ordinary way the method for making such islands was to get into their latitude and run along it, a plan still practised by many Pacific traders. To save time and lives, and in view of the fact that a few more days of her present death-rate would leave the ship too shorthanded to go about, he sailed straight northward for the island, with the result that he reached its latitude without sighting it, and was uncertain whether it lay to the eastward or the westward of him. He ran westward until (unknown to him) he was within a few hours' sail of the island; then, concluding he was wrong, stood eastward until he made the coast of Chile, and then ran back westward over the same ground until he made the island. This uncertainty as to his longitude lost him the lives of a number of his crew, who would probably have recovered if they could have been got ashore. This is no isolated case.

Many rewards had been on offer for a long time for the discovery of some better method of determining longitude: thus in 1598 Philip II. of Spain, possibly stimulated by memories of the Armada, offered a hundred thousand crowns, and the Dutch Government, soon afterwards, thirty thousand. The Spanish Government, also, for many years paid out small sums to encourage inventors, and cranks of all kinds, competing for their big reward; thus we find Lorenzo Ferrer Maldonado, the reputed discoverer of the Strait of Anian, receiving 200 ducats in 1626 for his discovery of "a compass without variation," which was expected to be of great use in finding the longitude (but why, is not obvious).

But the largest and most famous reward was that offered by the British Government in 1713, and it has the additional distinction of being, I believe, the only one which was ever paid. The main cause of its offer was not, curiously enough, the pressing needs of seamen, but a chimerical scheme brought forward by two gentlemen named Whiston and Ditton, whose names are now only remembered as the subject of a coarse poem by Swift.

They proposed that permanent floating lightships should be established at fixed points on the principal trade routes, firing at intervals star-shell arranged to burst at a height of 6440 feet, thus affording ships an opportunity of determining their distance from the nearest lightship by timing the interval between the flash and the report. They added that this method would be of particular use in the North Atlantic, where, they calmly stated, no depth exceeded 300 fathoms.

Whiston and Ditton, backed by a strong petition from the merchant shipping interest, procured the appointment of a committee to examine both their project and the whole question of finding longitude at sea. The outstanding feature of this committee was the evidence given by Sir

Isaac Newton, one of its members, who gave a short sketch of the "several projects, true in theory, but difficult to execute," proposed up to that time. It is noteworthy that he puts the chronometer method first.

As the result of the committee's report, a bill was passed offering the following rewards: £10,000 to the inventor of any method which, in the course of a voyage from England to any of the West India Islands and back, could determine the vessel's longitude to within 1°; £15,000 if it determined it to within 45′; and £20,000 if it determined it within half a degree.

At the same time the committee was remodelled as a permanent official body, having the title of the "Royal Commissioners constituting the Board of Longitude." This Board remained in existence for over a century, being finally dissolved in 1828. During its lifetime it had disbursed public money to the extent of £101,000. And here it may be mentioned that the Board of Longitude, like their Spanish predecessors already quoted, found themselves much exposed to the numerous tribe of cranks who are always to the fore when such questions are under discussion. By some obscure process of reasoning it became a widely received notion that the solution of the problem of longitude was inseparably connected with the perpetual motion and the squaring of the circle. And since there has hardly ever been a time when many people have not firmly believed that they possessed the solution of one or both of these problems, it may be imagined that their communications, together with a large number from lunatics and impostors, rendered the work of the Secretary to the Board somewhat harassing. To this day there are people who firmly believe that the British Government has offered an enormous reward for an exact value of π, and this error is entirely due to the £20,000 prize it once really did offer for "the discovery of the longitude."

The reward remained on offer for fifty years, and was then won by a chronometer, which thus asserted, for the first time, its definite superiority over all other methods of finding longitude at sea. Such machines had been tried before, but all had been failures.

The first attempt at constructing a marine timekeeper was made by the celebrated Christian Huyghens. About 1662 he constructed two clocks driven by springs, and fitted with short pendulums beating half-seconds. They were tried at sea by a Scottish officer named Major Holmes with moderate success, but it became evident that as a controller the pendulum was unsuitable for use at sea. Huyghens subsequently redesigned his clocks to be controlled by a balance, but although he worked on them for a long time he was unable to get satisfactory results, and concealed his failure in a cryptogram. At the same time Leibnitz, the great German mathematician, published an account of a marine timekeeper which he had invented. From his description it is obvious that it could never have worked, and it only affords confirmation of the fact that

Leibnitz, once he got outside the subject of pure mathematics, was prone to write on sciences whose principles he had not thoroughly mastered.

The next attempt was made by Henry Sully, an Englishman who spent his life in France and devoted it to horology. Sully was born about 1685, and died, prematurely and very poor, in 1728. He produced a watch, for use at sea, with two balances geared together, and in 1724 he presented to the Academy of Sciences a machine by which he believed he had solved the problem. Its controlling mechanism was a weighted lever, pivoted on friction rollers, and connected with a balance by means of a fine wire or silk thread playing between cycloidal cheeks. This design is, I believe, unique.

Sully made a number of these machines, which, when tested on shore, went fairly well at first, but soon became inaccurate. He abandoned this design, but while working on a new one died of inflammation of the lungs, brought on by overwork. One of his curious machines is preserved in the Museum of the Clockmakers' Company at the Guildhall, amongst a magnificent collection of old chronometers and pocket-chronometers, which any one who is interested in the subject should not fail to visit.

After Sully came the "father of the chronometer," John Harrison, winner of the £20,000 reward, and producer of the first reliable marine timekeeper. Harrison was a Yorkshireman, born at Foulby in 1693. He was brought up as a carpenter, but soon acquired a passion for clockmaking. At the age of twenty-five he had invented two very considerable improvements in the pendulum clocks of his day. One was the "gridiron" pendulum, in which the effects of heat and cold in lengthening or shortening it, and consequently making it swing slower or faster, are neutralized by a combination of brass and steel rods, which have, of course, different ratios of expansion. The other was a peculiar and delicate escapement called, from its appearance, the "grasshopper" escapement, which needed no oiling and had hardly any friction.

Harrison next turned his attention to winning the great reward, and designed a marine timekeeper. In 1728 he journeyed to London with his drawings, his pendulum, and his escapement, hoping to get assistance from the Board of Longitude. It is very doubtful whether he would have done so, but Fortune directed him instead to George Graham, a famous London clockmaker. Graham very wisely advised Harrison to make his machine before approaching the Board. He also helped him by lending him money, for which he refused to accept either interest or security.

From 1728 to 1735 Harrison was occupied in building his first timekeeper. Through the great kindness of the Astronomer Royal, I have the honour of being able to exhibit this identical machine to you this afternoon. It has been recently cleaned, but is not in going order. As you see, it has two enormous balances, which were connected together by wires in a practically frictionless manner. The balance springs, which are

missing, were four in number—helical springs in tension, acting on the ends of the balance-arms. Harrison made a clever use of his gridiron compensation to neutralize the effects of heat and cold on them. The escapement was a "grasshopper" in two parts, half being fitted on each balance staff, and both acting on the same escape wheel. Finally, he provided the machine with a small spring to keep it going while the mainspring was being wound up (which was done by pulling a cord coiled on a drum).

Crude though it may be, it is hard to praise this machine too highly. In my opinion, it is one of the most wonderful pieces of mechanism ever made. In constructing it Harrison, working single-handed and self-taught, grappled successfully with problems which had defied all previous efforts at solution. If the word means anything, he was a mechanical genius, and certainly he had "an infinite capacity for taking pains." For instance, all the wheels, except the escape-wheel, are of wood, turned out of solid oak, with the teeth, also of oak, let in in groups of four. These teeth, in turn, engage with pinions fitted with lignum-vitæ rollers to avoid friction. It is curious that Harrison, although he gave up the use of wood in his later machines, returned to it eventually. After his death an unfinished chronometer was found among his effects, made of several different alloys, such as bell metal and tutenag, while the arms of the balance were formed of hard wood.

Harrison completed the machine in 1735, and tried it successfully in a barge on the Humber, having made for it a wooden box slung in gimbals. He then applied to the Board of Longitude for a trial at sea, and was sent with it to Lisbon in H.M.S. *Centurion*, the ship which, some years later, took the Acapulco galleon and brought Anson home with nearly half a million sterling. Harrison and his timekeeper returned in H.M.S. *Orford* a month later. I have examined the logs of these two ships, but they do not say much about him. The machine, however, undoubtedly performed very well, and the captain of the *Orford* gave Harrison a certificate in which he stated, "When we made the land, the said land, according to my reckoning (and others) ought to have been the Start; but before we knew what land it was, John Harrison declared to me and the rest of the ship's company that, according to his observations with his machine, it ought to be the Lizard—the which, indeed, it was found to be, his observations showing the ship to be more west than my reckoning, above one degree and twenty-six miles."

Harrison exhibited his machine to the Board of Longitude soon after his return, and they advanced him £500 and desired him to make another, if possible a smaller one. As a matter of fact, he made three others, but none was tried at sea until 1761, and in the mean time he had a hard struggle to live, although the Board gave him several sums of £500 at intervals to assist him. These were subsequently deducted from the reward he received.

In 1749 the Royal Society awarded him the Copley medal, and long afterwards they offered to make him a Fellow, but he declined the honour in favour of his son, William Harrison, who had grown up to be his father's right-hand man.

Harrison's second and third machines may be passed over, since they exhibit only detailed improvements over No. 1, but in his No. 4 machine, which was a large watch about five inches in diameter, he produced a most wonderful piece of mechanism.

He abandoned in it the huge balances and complicated anti-friction devices of his earlier efforts. No. 4 is, in many ways, an enlarged version of the common pocket-watches of Harrison's day, with the addition of a number of contrivances which removed practically all the causes of their defective time-keeping.

First of all, he contrived a secondary spring to keep the watch going while the mainspring was being wound—a device which, as we have seen, he had fitted to his first machine many years earlier. There is no question that this "maintaining spring" was Harrison's invention, and it is still fitted in chronometers. This is the only one of Harrison's inventions which has not yet been superseded.

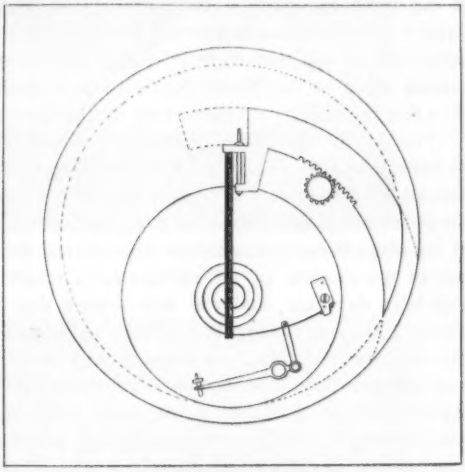
Secondly, he eliminated the errors caused by friction in the train of wheels by fitting a small spring which drove the escape-wheel direct, and which was wound up eight times a minute by the mainspring, the latter, of course, being wound once a day by hand. In this way he arranged that the force driving the escape wheel was practically constant, since the small spring had ten turns and never uncoiled more than a sixth of a turn before being rewound. This device, which is known to clockmakers by the name of a "remontoire," had been used by both Huyghens and Sully, but Harrison's application of it was novel and effective, and although the "remontoire" is no longer used in any form in chronometers, the detached escapement having rendered it superfluous, it was a powerful factor in Harrison's success.

It is worthy of note that the modern Riefler clock, the most accurate timekeeper yet made, employs this principle, and is wound every forty seconds.

Thirdly, although Harrison, not having room to fit his "grasshopper" escapement, retained the clumsy one of the watches of his day, called the "verge" escapement, he had shorn it of most of its errors by his remontoire, and he proceeded to improve it still further by making the pallets—the parts of the balance acted on by the escape wheel—of diamond, and curving them so that they were less effective when the balance vibrated through a long arc than when it described a short one. For the same purpose, that of isochronizing the arcs, he added a small pin, which he named the "cycloid pin," which was touched by the balance spring when the balance vibrated a long arc, and so, by reducing the spring's effective length, increased its strength. As a matter of fact he rather over-corrected

the defects of his escapement, and his balance described long arcs in slightly less time than it did short ones.

Finally, he provided his watch with a compensation for the effects of heat and cold. A rise of temperature makes a balance spring weaker, and also increases the moment of inertia of the balance, so that its beats are slower, and the watch loses. Cold has the reverse effect. When an ordinary watch is regulated by moving its indicator to "fast" or "slow," what happens is that one alters the position of two little pins, which hold the outside coil of the balance spring between them. By so doing you alter the effective length of the spring, and thus make it stronger or weaker. Harrison arranged an automatic way of doing this, and he used the same difference between the ratios of expansion of brass and steel which, as we have already seen, he employed in his earlier machines. Here is a view of his mechanism for effecting it. He took two thin strips of brass and steel and riveted them together, so that they formed a single compound strip, and he provided that two pins situated at one end of it should embrace the balance spring, while the other end was rigidly fixed. Now if, at a certain temperature, this strip were absolutely straight, it can easily be seen that on a rise of temperature the brass, expanding more than the steel, would cause the strip to become convex on the brass side, and concave on the steel side, and that if one end were rigidly held, the other would move the curb pins along the balance spring and so shorten it, thus increasing its strength to compensate for the weakening caused in it by the increased temperature. *Mutatis mutandis*, similar effects would occur for a fall of temperature. Harrison also provided that the position of this compound strip, which he called his "thermometer curb," could be shifted bodily so as to adjust the watch for mean time, but he found that this adjustment did not answer, and abandoned it. As we shall see later, this method of compensation is imperfect, and has been abandoned, but in its day it represented an enormous advance. Harrison himself was aware of its defects, and suggested, in a pamphlet I shall notice presently, that the compensation ought to be in the balance itself—as it now is.



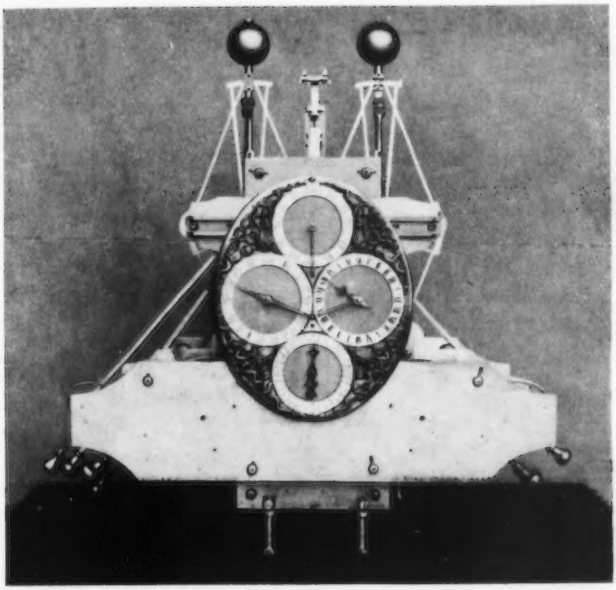
Harrison's compensation

The watch embodying these inventions of Harrison's is a beautiful piece of work, and very costly. It was jewelled wherever possible, to reduce friction, and the top plate and balance cock are a mass of the most elaborate chasing. How much of it is Harrison's own work is uncertain, but his master mind dominates its construction. It is marked "John Harrison and Son, 1759." The mainspring, remontoire spring, and maintaining spring were made by Maberly, a famous London spring-maker, and I think the chasing was the work of a jeweller; but all the elaborate mechanism, including the balance-spring, is undoubtedly Harrison's own work, assisted, of course, by his son. What Harrison himself thought of it can be seen from an unpublished description of it which he wrote, and of which I possess a copy. He concludes his account of the watch by saying, "And I heartily thank Almighty God that I have lived so long, as in some measure to compleat it . . . , and I think I may make bold to say, that there is neither any other Mechanical or Mathematical thing in the World that is more beautiful or curious in texture than this my watch or Time-keeper for the Longitude."

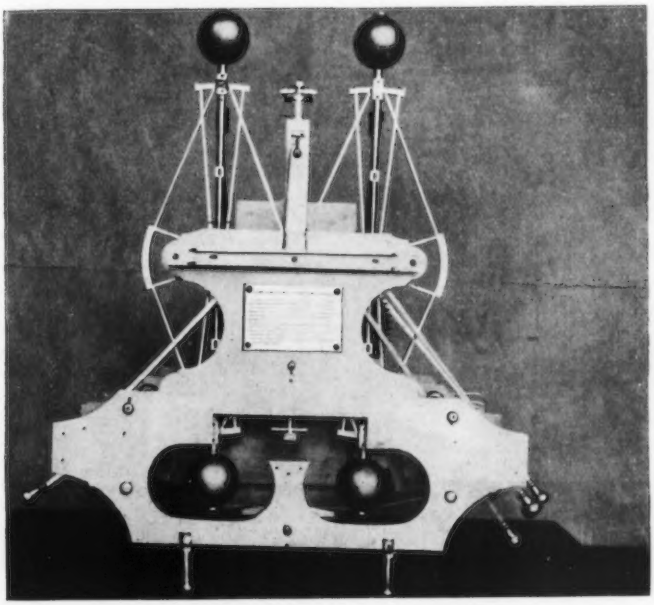
The Astronomer Royal very kindly offered me the loan of this watch in order that I might exhibit it to you, but, with his permission, I chose instead the duplicate of it made ten years later by Larcum Kendall, since the latter is an exact copy of No. 4, and has an added interest by reason of its magnificent performances when tested for several years at sea by one of the greatest of all navigators—Captain James Cook. Here is Kendall's duplicate, and you will observe that it is simply an enlarged watch, and is not slung in gimbals. Although he had used them with his first machine, Harrison subsequently took an aversion to gimbals, and alleged that they caused more errors than they avoided. It is certain, though, that had he employed them for No. 4 he would have annulled one of the few remaining defects of his masterpiece—its varying rate of going in different positions.

Harrison had applied in 1757 for a trial of his third machine, under the Act of Queen Anne, but the granting of this was delayed for various reasons until 1761, by which time No. 4 was finished. As Harrison was now sixty-eight, his son, William Harrison, was allowed to sail in his stead, and he left Portsmouth with No. 4, aboard H.M.S. *Deptford*, on 18 November 1761. After eighteen days at sea the dead reckoning gave the ship's longitude as 13° 50′ W., but by the chronometer it was 15° 19′ W., and William Harrison asseverated so strongly that the latter was correct that the ship, which was bound for Madeira, altered course accordingly, and the island, as he had predicted, was sighted next day. This, as a contemporary account put it, was a matter of relief to the ship's company, who were then in great want of beer.

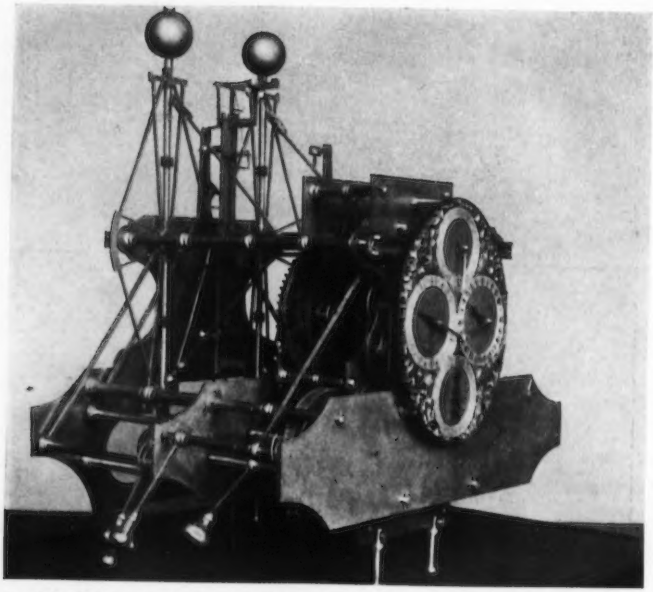
When the *Deptford* reached Port Royal, sixty-one days out from Portsmouth, the watch was found to be nine seconds slow, and on its return to Portsmouth, in very stormy weather, its total error after an absence of



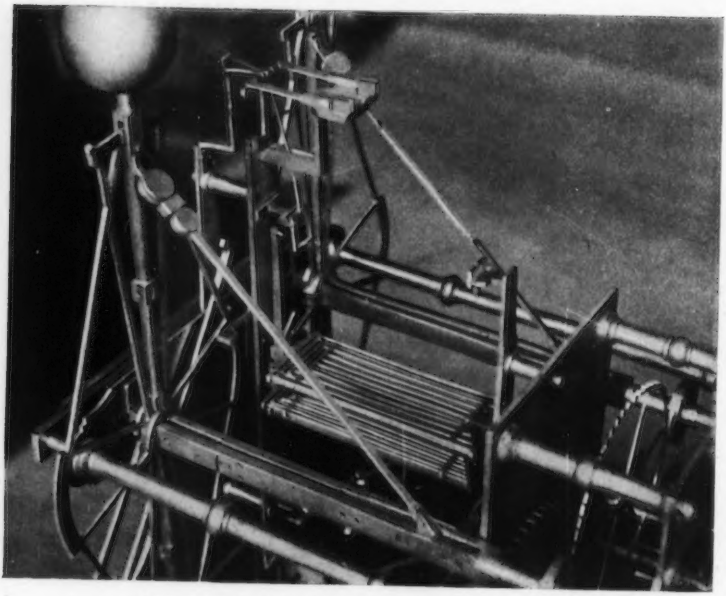
HARRISON'S FIRST CHRONOMETER: FRONT VIEW: DIALS AND HEADS OF BALANCES



BACK VIEW: THE COUPLED BALANCES



HARRISON'S FIRST CHRONOMETER: SIDE VIEW: TRAIN AND BALANCE



THE BALANCES AND GRIDIRON FROM ABOVE

five months was 1 min. 53½ sec., corresponding to an error in longitude of 28½′. Harrison's pride in his masterpiece was not unjustified.

The longitude of Jamaica, however, was then regarded as rather uncertain, and although the Board of Longitude advanced £5000 to Harrison on account of the reward, they demanded a fresh trial of the watch, and accordingly, in 1764, William Harrison and No. 4 were sent in H.M.S. *Tartar* to Barbados, accompanied by Dr. Maskelyne as representative of the Board. Harrison declared the rate of his watch, before sailing, as one second a day gaining. No. 4's error at Barbados was forty-three seconds, and after returning to England its total error, allowing for rate, was fifty-four seconds in a period of 156 days, corresponding to an error in longitude of about 14′—a far finer performance even than its voyage to Jamaica.

Then began a long and bitter struggle between Harrison and the Board of Longitude. Harrison contended that he had complied with the terms of the Act, and demanded the £20,000. The Board pointed out that the winning method, whatever it was, had to be shown "generally practicable and useful," and they demanded that he should first explain, and give drawings of, the mechanism of his timekeeper, also that a copy of it should be made by some other person. After much wrangling and paper warfare, Harrison complied with these conditions, and took his timekeeper to pieces before a committee of scientists and watchmakers nominated by the Board. Even then there was much delay; but in 1765 Harrison was paid another £5000, and finally in 1773, after the personal intervention of H.M. King George III., he received a further £8750, which completed the amount of the reward. The Board, however, entered a silent but effective protest against the finality of his work by immediately procuring the passage of an Act of Parliament offering a further reward of £10,000 for any means of finding the longitude within half a degree. They stipulated that, if this were competed for by a timekeeper, such machine's total error should not exceed four minutes in six months.

The copy of Harrison's watch demanded by the Board was made by Larcum Kendall in 1766–1769. Kendall only contracted to make an exact part-for-part copy, without guaranteeing its performance, and charged £450 for it. This is the watch I have here, and its going, when tried at sea, reflected the greatest credit on both Harrison and Kendall. Captain Cook had it with him in the *Resolution* on his Antarctic voyage, 1772–1775, which, with its alternations of dead calm and furious gales, tropical heat and extreme cold, was as severe a test as could well be imagined, yet so well did the watch perform that Cook remarks in his Journal, "I must here take note that our longitudes can *never* be erroneous while we have so good a guide as Mr. Kendall's watch." He made a special point, also, of asking for this watch when he sailed again in the *Resolution* on his third voyage in 1776. It is curious to note that the accuracy of its going put the Board in the anomalous position of continuing to offer a reward of

£10,000 for a feat which this chronometer in their possession had already shown itself fully capable of performing.

Harrison, while waiting to receive his reward, made a fifth watch, an improved No. 4, which is now in the Guildhall Museum, and in 1775 he published an extraordinary pamphlet called "A description concerning such mechanism as will afford a nice or true mensuration of time." This work, which, unlike previous pamphlets published in his name, was his own unaided production, affords proof of the statement, often made in his lifetime, that it was exceedingly difficult for him to express his ideas, either verbally or in writing. The manuscript of it is in my possession, and, although the handwriting is quite clear, the meaning is often unintelligible.

Harrison, who thus ended his long and laborious life in the enjoyment of well-deserved success and reward, died in 1776, aged eighty-three, and was buried at Hampstead.

Although he had "blazed the trail," his chronometer was superseded almost immediately by others of simpler design. Only two men followed in his footsteps, Larcum Kendall and Thomas Mudge. Kendall, as we have seen, made the copy of No. 4 which performed so well, and he then tried his hand at simplifying Harrison's construction. He made two attempts at this, one of which was the famous chronometer stolen with the *Bounty*, and recovered fifty years later in Chile, but neither was so good a timekeeper as his copy of No. 4. The *Bounty's* chronometer, which, by courtesy of the Secretary of the Royal United Service Institution, I examined a short time ago, is simply a large ordinary watch, with a compensation curb, but no remontoire. It is still in going order. Kendall's second attempt, now at Greenwich, is a watch with a peculiar escapement of his own designing, and he afterwards made a beautiful little pocket-chronometer, now in the Guildhall Museum, in which he reverted to the principles of No. 4 and fitted a remontoire.

Far more important, in the history of the chronometer, is Thomas Mudge, a London maker who devoted the last twenty years of his life to improving marine timekeepers. He was a gifted horologist and a most amiable man, but his chronometer, beautiful piece of mechanism though it was, proved far too complicated. It may be described as an over-developed No. 4. Harrison's watch went for a day, Mudge's for eight days: No. 4 had a single balance spring and compensation curb, Mudge fitted two of each: Harrison's remontoire was wound eight times a minute, Mudge's machine had two remontoires, each wound up three hundred times a minute: lastly, Harrison's workmanship was good, but Mudge's was exquisite.

His movement embodies two balance springs, one for regulating and one for compensation. Two small spiral springs form the remontoires, and they are alternately wound by the escape wheel and unlocked by the balance. The upper and lower ends of the balance staff run

between friction wheels. Adjusting this escapement was no simple matter, but the weak spot of Mudge's chronometers was not so much that as the defective, although ingenious, compensation.

It is due to Mudge's memory to say that he planned his chronometer before becoming acquainted with the details of Harrison's. He built three of them, but, although repeatedly tried at the Royal Observatory, they did not satisfy the new conditions imposed by the Board of Longitude. He finally petitioned Parliament for a reward, and, in spite of the Board, was awarded £3000. He died in 1794. Mudge's best title to fame is that he was the inventor of the detached lever escapement, now almost universally employed in watches.

But Mudge was passed in the race by other competitors. Foremost amongst them, and second only to Harrison himself, is Pierre Le Roy, a Frenchman, and the true father of the modern chronometer. In 1766 Le Roy presented to King Louis XVI. a marine chronometer of his invention, embodying all the main features of a present-day one. It was suspended in gimbals, which removed all errors of position, and had a single dial showing hours, minutes, and seconds, the hour-hand turning to the left.

The machine really consisted of an enormous balance, weighing about 5 ozs., with a comparatively small watch-movement to keep it swinging. It was suspended by a thin piece of harpsichord wire, and kept in position by friction-rollers. This suspension is very delicate, but fragile, as is shown by the fact that while Le Roy was posting down to Havre with two of these chronometers for trial at sea, the wire of one balance was broken by the motion of the carriage. Nothing daunted, however, he fitted a new wire at his inn that night, and reached Havre with both of his chronometers going.

Le Roy was the discoverer of the fact that any balance spring can be made practically isochronous—that is, able to make the balance describe long and short arcs in equal times—if it be of one particular length, which can be found by experiment. Accordingly he abandoned the use of a compensation curb, which acts by altering the length of the balance spring. Also, having obtained an isochronous spring (or springs, for he used two), it was unnecessary to employ either a remontoire or a fusee, since variations in the driving force might alter the arc described by the balance, but could not affect its time of describing them. Consequently he fitted his chronometer with what is called a "going barrel," now used in almost all watches, in which the mainspring acts on the train of wheels with a force varying directly as its tension.

His escapement, too, was a tremendous improvement on Harrison's. It was "detached": that is to say, it left the balance free to swing, except for the moment when it was unlocking the escapement and receiving impulse. Lastly, he put his compensation in the place where, as Harrison pointed out, it ought to be—in the balance. He invented a balance

composed of brass and steel strips, which we shall afterwards find Arnold and Earnshaw using, but he finally devised and adopted a very ingenious one which had two thermometer tubes filled with mercury and alcohol, and so arranged that a rise of temperature diminished the inertia of the balance in such a proportion as to compensate for the weakening of the spring, and *vice versâ*. A similar balance was successfully used, long afterwards, by an English maker named Loseby.

Le Roy's chronometer, which is preserved in the *Musée des Arts et Mètiers* at Paris, was tried at sea, with another like it, in 1767 and 1768, and their performances in both cases were extremely good. Le Roy, however, never received such public recognition or reward as had been granted to Harrison. As M. Gros, in his excellent treatise on 'Escapements,' has indignantly remarked (I translate), "Harrison, for the invention of a mechanism which was abandoned almost immediately, received £20,000: the Frenchman of genius, who has added one more to the glories of France, received—a medal."

Since Le Roy's chronometer was completed before any particulars of Harrison's work had been published, its design was entirely original, and reflects the very greatest credit upon its inventor.

Contemporary with Le Roy was his great rival, Ferdinand Berthoud, who also devoted many years to the improvement of chronometers. He is chiefly remarkable for the extraordinary variety of his conceptions. Some of his chronometers were controlled by a balance; some by two balances geared together; one by a pendulum. Some were driven by weights, and some by springs. Some had compensation curbs, some compensation balances; at least one had both. Some had cylinder escapements, some detent escapements, and some were fitted with modifications of various other patterns. Some were fixed, some slung in gimbals; some had their dials vertical, some horizontal, and the dials themselves exhibited many differences of arrangement. Berthoud's industry and inventiveness were amazing (he was also, in his spare time, one of the most voluminous writers on horology who ever lived), but his work does not exhibit quite the scientific thoroughness or the perfect adaptation of means to ends which characterize that of Le Roy.

I regret very much that I am unable to show you portraits of either Le Roy or Berthoud, but I have here a little chronometer by Berthoud. It is an early one, No. 37, made about 1785. It is still a good timekeeper, and in one or two points I prefer it to a modern chronometer, since you can wind it without turning it upside down, as you have to do nowadays; you can lock the balance in a moment without doing it any injury, and you can set the hands to any hour, minute, and second you like while the chronometer is going. It has a compensation curb *and* a compensation balance. The escapement is a detached one—a pivoted detent.

But at the same time that Berthoud was making machines such as this, the mechanism of the chronometer was undergoing its last important

development at the hands of two Englishmen, John Arnold and Thomas Earnshaw. These two were contemporaries, and hated each other cordially.

John Arnold was for some time a gunsmith, and first made his mark in London as a clockmaker in 1765, when he presented to H.M. King George III. an extraordinarily small watch, which was the size of a silver two-penny piece, and weighed 127 grains. In spite of its absurdly small size it was a half-quarter repeater. He turned his attention to chronometers, and three of his early efforts were sent aboard the *Resolution* and *Adventure*, on their Antarctic voyage, for comparison with Kendall's copy of Harrison's No. 4. Two of these are in possession of the Royal Society, who have kindly permitted me to exhibit them. They have compensation curbs, like No. 4, and most peculiar escapements, which are quite unique, and impossible to describe briefly. They were not good timekeepers, and Arnold set about making better ones.

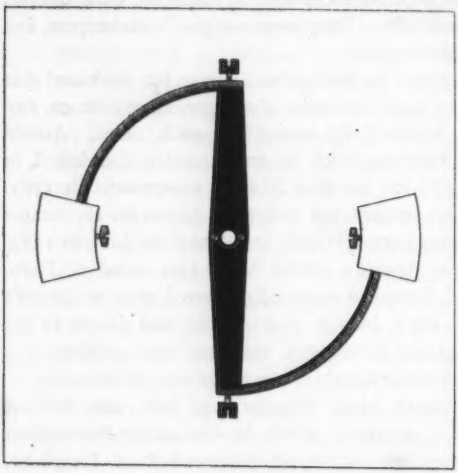
And here it becomes difficult to distinguish between his work and that of Earnshaw. Both men brought out forms of compensating balance, and of detached escapement, substantially resembling each other. Arnold patented a compensation balance, which he subsequently abandoned, in 1775, and took out a patent for his final form of escapement in 1782. Earnshaw never patented his balance, but took out a patent for his escapement, or, rather, got a maker named Wright to patent it for him, in 1783. So that in point of priority Arnold's patent was a year ahead of Earnshaw's. On the other hand, Earnshaw repeatedly asserted, once in Arnold's presence and that of the Lord Mayor, that Arnold had learnt of his invention from a maker named Brockbank, and filed his specification a week later; and to this challenge Arnold never made any public reply.

Nowadays it is possible to admit the merits of both men without further probing this vexed question, which is essentially this—either the inventions were independent or Arnold borrowed from Earnshaw. As the improvements made by both men had much in common, and those of Earnshaw became the standard, I will not confuse you by illustrating or describing Arnold's. He never entered any chronometers for public trial at Greenwich, but—and this is the important point—he established a manufactory of them at Chigwell in Essex, and so for the first time made them available to seamen generally. This was a service the importance of which is hard to over-rate. No longer were chronometers to be the jealously prized possession of a few chosen navigators. In 1799, when Arnold died, he and his men had made over one thousand good chronometers, and Earnshaw upwards of five hundred, and never again was there to be any need for ships to run the risks they had done even twenty years before.

The Board of Longitude paid Arnold, at various dates, £1322 in recognition of his valuable work, and in 1806 they made it up to £3000, paying the balance to his son, John Roger Arnold, who succeeded him.

Thomas Earnshaw, Arnold's rival, was born in 1749. From all

accounts, he was an independent and straightforward man, somewhat abrupt and unpolished in his manner, but a consummate horologist. He worked his way up from the position of a watch-jobber to that of a chronometer manufacturer. In 1783, as we have seen, he introduced his new escapement and balance. The escapement's action is very simple, yet in the hundred and forty years since he invented it no better one has been devised, nor is it easy to see how it could be simplified or bettered. A tooth of the escape wheel is locked by a detent mounted on a spring, which carries a second small spring on its tip. As the balance swings, a projection on a roller mounted on the balance-staff engages with the small spring, which presses on the detent-spring and bends it slightly, thus releasing the tooth. The escape-wheel promptly turns, and in so doing another tooth falls on a stone fixed in the roller and gives the balance an impulse. The detent-spring resumes its position, and the next tooth locks on it. As the balance swings back, the projection again hits the small spring, but this now merely gives way to it, and the tooth remains locked. This escapement is the best known for use in chronometers. It only gives impulse in one direction, and is not self-starting.



Earnshaw's balance

Arnold's escapement was very like this, except that the escape-wheel turned the other way, and the detent unlocked by moving inwards. J. R. Arnold, however, is known to have admitted, in private conversation, that Earnshaw's escapement was the better, and after the latter's death in 1829 he adopted it. Still, Arnold's was a perfectly adequate escapement. I have a pocket chronometer fitted with it, made about 1815, which is an excellent timekeeper, though subject to the defect of all watches with a chronometer escapement, that any sudden jerk may stop them, and they will not start themselves. The lever escapement, on the other hand, is self-starting, hence its practically universal employment in watches. It would be used in chronometers, too, but for the fact that it needs oiling, and that the ageing of the oil affects its performance. The chronometer escapement needs no oil.

In Earnshaw's balance the curved arms are made, like Harrison's "thermometer curb," of brass and steel strips, not riveted, but fused together, the brass outside. As the temperature rises, the weights are brought slightly nearer the centre and so decrease the inertia of the balance. The two small screws are for mean time adjustment.

Earnshaw was paid £3000 in 1806 as a reward for his improvements. But he was much dissatisfied with this amount, and in 1808 issued a pamphlet called 'Longitude—An Appeal to the Public,' in which he stated his grievances. This work, although perfectly honest and candid, and containing valuable information, is a masterpiece of unconscious humour. For instance, he winds up an impassioned apostrophe to the Hydrographer of the Navy with the delightful peroration, "Do this, and Earnshaw is your friend"!

And at this point the history of the chronometer, as far as the development of its mechanism is concerned, practically terminates. It is, indeed, a conclusive testimony to the finality of Earnshaw's work that one of the greatest mechanicians who ever lived, Abraham Louis Breguet, could find practically nothing in the chronometer, as he left it, which would bear improvement. Breguet devised an exceedingly delicate and beautiful remontoire escapement, which he used in some of his chronometers, but which gave no better results than Earnshaw's; and he showed his extraordinary power of cutting the Gordian knot of a mechanical difficulty by producing a mechanism which entirely did away with the position-errors of pocket chronometers. This he did by a device which he called a "tourbillon," and which provided that the escapement gradually revolved in a circle, and consequently had no fixed position.

But, generally speaking, the transformation of the chronometer, from a possibility to a commercial actuality, took place between the years 1761 and 1785, and later makers have more or less accepted the mechanism of the chronometer as Earnshaw left it, and devoted their energy to improving the compensation. For the simple compensation balance devised by Earnshaw can only be absolutely correct at two particular temperatures. Between these a chronometer with that compensation will gain, and outside them it will lose. Several devices, however, have since been introduced which more or less surmount this defect.

Here I must finish my sketch of the chronometer's history, and, in concluding it, let me express the hope that, in whatever manner the future history of the chronometer and its makers may be affected by the recent developments of wireless time signals and wireless direction finding, it may be many a long year before the chronometer as a means of finding longitude is superseded, and that even when Macaulay's New Zealander, in years to come, visits the ruins of Greenwich Observatory and finds the chronometer-room long deserted and forgotten, there may yet be some living who still remember the little band of men who bequeathed us the

chronometer of to-day—Le Roy, Mudge, Berthoud, Arnold, Earnshaw, and, above all, John Harrison.

Before the paper the PRESIDENT said: I have much pleasure in introducing to you Commander Gould, one of the staff of the Hydrographer at the Admiralty, who has for a long time past taken a special interest in chronometer construction.

Commander Gould then read the paper printed above, and a discussion followed.

The PRESIDENT: The Hydrographer of the Navy has honoured us with his presence, and we shall be indebted to him if he will open the discussion.

The HYDROGRAPHER: I think we have all listened with very great interest to this lecture, which is somewhat technical, and perhaps some of those present did not quite understand all the points; but I would like first to say this, that we are extremely fortunate for the permission which has been afforded us for Lieut.-Commander Gould to give his lecture under the auspices of the Royal Geographical Society. It is apparent, I think, that a great deal of research and study has been compressed into a comparatively short lecture in order to cover so much ground going back over two hundred years, and that has only been possible by the assistance of those interested in horology; and I should like to say how very much we are indebted to the Astronomer Royal, for it is only by his extreme courtesy that we are able to see all these very delicate and extremely valuable instruments. The archives of the Royal Observatory have been carefully studied, and much has been included in the interesting form of this paper. It is quite true to say this, that when we go back to such a period as one hundred and fifty years ago—and it can be amply borne out by complete evidence—many longitudes determined by Cook's chronometers stand to this day without material alteration. There were no submarine cables or wireless telegraphy in those days, and voyages occupied generally four years—to this day those longitudes remain practically as they were then determined, and it is due to the workmanship of these chronometers which we have seen, one of which was actually on board the *Resolution*, that such results were possible. Coming to a later period, it is the same on the coast of South America, particularly Chile and Peru. So much for the past. Dealing with the almost immediate past (I refer to the epoch during the war), there is a point which may perhaps not have struck you, and that is the immense number of chronometers then made and the very large number lost by sinkings. Many of the chronometers made in this country were by people not necessarily bearing English names, and our then enemies were responsible for very good chronometers of high workmanship. We reached a position towards the middle of 1917 when they were of extreme value. There were not enough to go round, and the Admiralty had perforce to ask those who possessed chronometers, perhaps of great age and history attaching to them as family heirlooms, to lend or dispose of them to the Admiralty. These were, in most cases, of quite good workmanship and only required cleaning, and they were used and "did their bit" in the war. The response was very cordial, and many owners had already volunteered in this way. The difficulty in obtaining chronometers is not being able to turn them out quickly. The war thus produced a severe strain on British enterprise, but we were able to meet all requirements, largely through the good help afforded by the Astronomer Royal and his able staff, for it is not sufficient to manufacture chronometers—they have to be rated and put in proper working order at Greenwich Observatory before they can be issued. Dealing with the future, I think the lecturer alluded very briefly to wireless

telegraphy, which it might be considered at first almost does away with the necessity of ships carrying chronometers. That is not quite so nor likely to be, though I make a guarded statement. In the Navy we have not reduced the number of chronometers carried, and there is no intention of doing so at the present time. It is quite true to say that the introduction of wireless telegraphy, as applied to time keeping, very much facilitates the use of chronometers on board ship, and the difficulty of rating is very much simplified; but it will probably be many years before we shall see any diminution of those chronometers carried on board, notwithstanding that it is obligatory for most ships to carry an outfit of wireless telegraphy. It is possible now, each day, for all those who have these instruments and receiving apparatus and are within range—by means of the Vernier time signals sent out from the Eiffel Tower—to accurately determine errors easily within one-hundredth second of time, by this delicate method, which I have no doubt many here are familiar with. By means of a chronograph and relay you can reduce that error to something very much less, and the difficulties of interference such as atmospherics and jamming are largely surmounted. There is not very much literature on this subject. We have Captain Shadwell's 'Notes on the Management of Chronometers,' which is sixty years old now, but there is not very much published of a standard type, and I throw out the suggestion to Lieut.-Commander Gould, that perhaps he might be able to follow up his researches, and put into practical form something more in the shape of a history than what we have listened to with so great an interest this afternoon. I am sure, as Lieut.-Commander Gould has told me, you will appreciate it is extremely difficult to go searching for data in all likely quarters, and of necessity you miss many points, and the links are getting more difficult to connect year by year.

The ASTRONOMER ROYAL: Commander Gould has given us a paper on, I think we shall all agree, a very attractive subject, and we shall all further agree he has treated it in a very attractive manner indeed. I think he is particularly well suited to give a lecture on the chronometer, because he combines the taste for historical research with the gift of the manual dexterity, the love of taking instruments to pieces, absolutely necessary to any one who is going to read in an interesting manner, and thoroughly understand such a complicated instrument as the chronometer. The Hydrographer spoke of Commander Gould as being indebted to us at the Observatory, but, to tell the truth, the boot is actually on the other foot, and we are deeply indebted to Commander Gould. It is a very good thing to begin with to find a man thoroughly interested in the history who will go over the records. I suppose there must be many places where there are valuable records, and it does not fall into the province of the people to examine their old records. We owe to Commander Gould the restoration of this extremely beautiful and valuable instrument which you see here. I hardly like to tell you how bad a condition it had got into after a number of years, but Commander Gould took it, and after taking it to pieces—it took him many months to do—you see what a beautiful instrument he has made of it. It is very desirable that this instrument, which is of the greatest historical value, should be kept in a nice state of preservation, and I can say I am very greatly indebted to Commander Gould, and will take good care that the instrument does not get into a bad way again. This was all done with his own hands. I should like to say how heartily I sympathize with the remark which the Hydrographer let fall, that this lecture will only be the summary of the principal points in the history of the chronometer, and that Commander Gould will write a more complete and fuller history of it. He is

well qualified for such a task, and it would be a very interesting thing to have the whole story of Harrison and Earnshaw and Arnold all put down in a book. One point which struck me particularly, I did not know it before, was the high position Le Roy held and how early he was in the field. It is extremely interesting to hear that the French were so very little behind Harrison. Commander Gould did not mention anything about the astronomers' method of finding longitude by lunars, but I should have thought that in their long voyages when they went to Australia they would not trust entirely to their chronometers. The Hydrographer has said we have a rival in the way of wireless signals. I think they may very well act in the way of getting for us generally increased accuracy, and the chronometer will be used alongside them, and the rate will be perfectly well known. The Hydrographer spoke about the German chronometers. Curiously enough, we had given to Greenwich the chronometer from the *Emden*, and it had a German mark on it, but when we examined it we came to the conclusion it was made in Clerkenwell. I do not know that I have anything more to say except how much I have enjoyed Commander Gould's lecture.

Mr. A. R. HINKS: We have all been admiring these beautiful specimens of workmanship of John Harrison, and I should like to remind those interested that there is an equally beautiful and even more delicate example of his work in the possession of the Royal Astronomical Society. For a good long time the Society had standing in the assistant secretary's room the Harrison clock, which within memory had never gone. It had been submitted to various clockmakers, who had always proposed to scrap the escapement and substitute something more modern. Happily that had always been resisted by the Society, and at last, some years ago, Mr. Cottingham, a very distinguished clockmaker, who is now, I believe, engaged in making the new standard clock for the Royal Observatory, undertook as a labour of love the restoration of the Harrison clock of the most marvellous workmanship, and with the very interesting grasshopper escapement that Commander Gould mentioned just now. It stands in the rooms of the Astronomical Society, and I feel sure any one interested in perfecting his knowledge of Harrison's work would be welcome to see the clock, which is arranged with mirrors and lit inside. Sometimes it is working and sometimes it is not. It has that very refined escapement; and although Mr. Cottingham makes it go for several months at a time, one has to admit that it does stop, and has to wait for a visit from him, because nobody else is sufficiently bold to tackle it.

The PRESIDENT: We are much indebted to Commander Gould for giving us this history of the chronometer. At sea we are so accustomed nowadays to using these chronometers, and even we on land, in our explorations have to use pocket chronometers, that we have come to take them as a matter of course. So it is very pleasant to be reminded of the enormous value they are to us and of what the poor unfortunate navigators in the old days before they had these advantages had to go through. We should like in this Society to give credit to and remember the names of those who, in the old days, through their genius, have given us the advantages we now enjoy. I do not know whether Earnshaw did succeed in getting the friendship of the hydrographer of the time, but I am sure all future hydrographers will be glad to give him their friendship. We should like now to give a hearty vote of thanks to Commander Gould for collecting this information and giving us such an admirable and most attractive paper, and I should like to add my hope to that of the Hydrographer and of the Astronomer Royal that he should develop it into some larger and more permanent record.

THE MOUNT EVEREST EXPEDITION: ORGANIZATION AND EQUIPMENT

By Members of the Expedition and of the Committee

Addresses delivered at the Meeting of the Society, 7 March 1921.

The Object of the Expedition.

Lieut.-Colonel Sir FRANCIS YOUNGHUSBAND, President of the Committee.

WIDESPREAD interest has been aroused by the announcement that the Alpine Club and this Society are organizing an expedition with the object of ascending Mount Everest. From many different countries came applications to take part in it. But yet I am also being continually asked, What is our object in climbing the mountain? What shall we do when we get to the top? What do we expect to get there? Who will be a penny the better for our having reached the summit? I was even asked on the telephone by an enterprising journalist to tell him for the benefit of his paper "what good there would be to the general mass of humanity in the ascent of Mount Everest."

I had better once again answer such questions, for it is important that people should have no doubt or misgivings in their minds as to the good which will accrue, even to the general mass of humanity, from the ascent of Mount Everest.

A porter on an underground railway may be considered as about as representative as any we can find of the general mass of humanity. The other day I heard of one who laid it down as an absolute certainty that we could never reach the top. He had been with us in Tibet and had seen these Himalayan peaks. And "they might take it from him that the top of Mount Everest would never be reached."

Now if the human race had always acted in the spirit of the general mass it would never have emerged from the primeval forest. We should be still timid uncultured people hiding in caves and the forest depths. Fortunately, however, there were always daring leaders who struck out ahead of the general mass. They ventured out into the open plains, on to the rivers, on to the sea, even up into the air. And it was an uncommonly good thing for the general mass that they did. The leaders with spirit and imagination showed the way. The herd were glad enough to follow after and pick up all the benefits. But the mass would never have had those benefits if there had not been leaders to give the lead. Very often these leaders did not survive. The fittest to survive were those who stayed at home. But they led the way, which is a good deal better than surviving. And men must always look for leaders who will venture as they did.

Now the human race does not like to leave any spot in this little planet of ours unvisited. And for thirty years, at least, that is since General

Bruce first put forward the idea, men have had the ambition to ascend the highest point on the Earth. It is a very natural and praiseworthy ambition; General Rawling and many of the Alpine Club have entertained it. Lord Curzon also intended to further this ambition and suggested, when he was Viceroy of India, that this Society and the Alpine Club should take the matter up together. And the advantage that will come from ascending Mount Everest is this—that once the highest peak has been climbed men will pluck up courage to ascend all manner of other mountains. Even to the obtuse mass of humanity it will then be evident that men are capable of higher achievement than they had ever imagined.

As to the advantages of mountain climbing in general a Frenchman a few days ago bore striking testimony. Speaking here in London at the Institut Français, M. Léon Bérard, Minister of Public Instruction, told how his countrymen had shared with Chateaubriand a dislike of mountains, but that the example of the English cured them of their prejudice and revealed to them in a new way the beauty of their country. M. Bérard was referring more particularly to his own part of France at the foot of the Pyrenees.

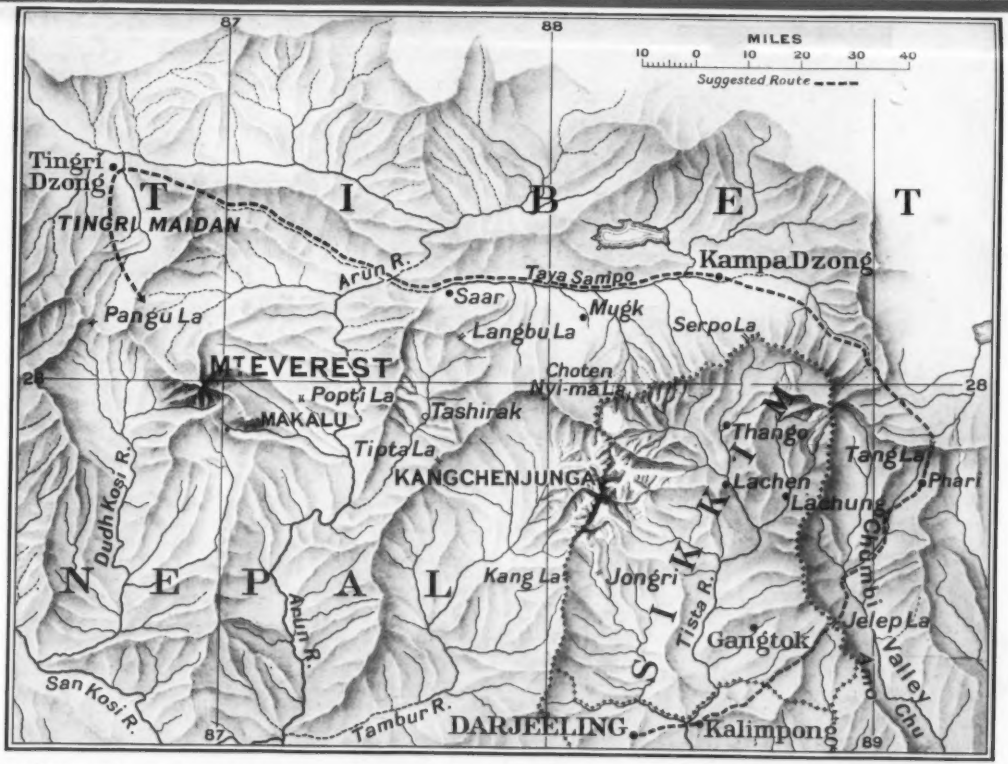
We acknowledge with gratitude the graceful compliment of the Frenchman. But we shall not be so immodest as to appropriate to ourselves alone the credit of discovering beauty in mountains. For others besides ourselves—and those others include many a Frenchman—have made the discovery that by going in among great mountains, climbing them, getting to know them thoroughly, entering into their spirit, there are beauties to be found in mountains of which the plainsman never dreams.

So the ascent of Mount Everest, by stimulating mountain-climbing in general, will bring more beauty to light. And beauty is one of the world's richest riches. We cannot expect that on the instant the general mass of humanity will suddenly derive good from the ascent. But we can be perfectly sure that in the long run even porters on underground railways will find their blood stirring more quickly with the sense of high achievement, and will feel life richer for the new beauties which have come into it.

The Approach to the Mountain.

Prof. NORMAN COLLIE, President of the Alpine Club.

Before I say anything about the reconnaissance I should like to supplement what the President has said about the uses of this expedition. The expedition will have to explore new country of the highest importance, not only high because it is high above the sea-level, but because it holds the finest mountain range in the world. Geologically, it is necessary to know how the rocks and the strata are lying round this great peak Everest. Then, botanically, there is no doubt that a number of Alpine plants that grow at very high altitudes—18,000 to 20,000 feet—will be brought back. The authorities at the Natural History Museum have assured us that if the expedition will only catch all the small mice,



SKETCH-MAP OF THE MOUNT EVEREST REGION SHOWING REVISED ROUTE OF THE EXPEDITION

Makalu Everest N53 C A B

MOUNT EVEREST AND THE MOUNTAINS TO THE NORTH, PHOTOGRAPHED BY DR. KELLAS IN DECEMBER 1920 FROM A

MOUNT EVEREST AND THE MOUNTAINS TO THE NORTH, PHOTOGRAPHED BY DR. KELLAS IN DECEMBER 1920 FROM A

rats, and other rodents that they find on these high plateaux, at least sixty per cent., and possibly more, will be new to science. I do not think a more interesting expedition could possibly be made, and it is to be carried out at a cost much smaller than that of any big expedition I know; therefore I think the public should recognize this and support it. It does not matter how much they give, in one way, as long as they give something. Five thousand pounds is easily made up by ten shillings each from those interested.

Proceeding now to the reconnaissance of Mount Everest; I thought first it would be moderately easy. At the meeting when General Bruce addressed you in November, Captain Longstaff said you have to find Everest first, and I thought it rather an unnecessary remark: a mountain of 29,000 feet could not be mistaken. But from information that has been sent by Dr. Kellas, I am beginning to think there is more in what Captain Longstaff said than at first appeared. The expedition will start from Darjeeling into the Chumbi valley, and over the passes thence into Tibet. Between Kangchenjunga and the great mass of Everest and Makalu is the great valley of the Arun river, draining all the country at the back of the mountain. Undoubtedly there is a route up the Arun valley over to Tibet, and the higher up you join the main route the better.

Prof. Collie then discussed some telephotographic pictures of Mount Everest and the mountains to the north taken by Dr. Kellas in December 1920 from the neighbourhood of the Kang La on the ridge running north from Darjeeling, with an approximate identification and location of the various peaks attempted by Dr. Kellas. These photographs were taken from the point to which Mr. Freshfield directed attention in his account of his Kangchenjunga expedition, as a point from which the Survey of India should photograph the country. From this material Prof. Collie concluded that there are two principal valleys running up to Mount Everest, one on the north, and one on the north-east, and that the approach must be by one of these, the western side being apparently very steep.

The Plans of the Expedition.

Colonel HOWARD BURY, Chief of the Expedition.

The expedition is to start shortly, and during the last few weeks we have been busy in making preparations and trying to collect stores and equipment. Part of the expedition may have to live at great heights for a considerable time, and one has been experimenting with small details such as primus stoves to burn at over 20,000 feet. You cannot keep fit unless you have good and hot food. It is of the very greatest importance to have food easily digestible, which can be easily warmed up at very great heights. The expedition has been organized by Sir Francis Younghusband, and to him has been practically due the fact

that it has been brought into being. His energy here and his work with the various authorities have brought the expedition into being. The main object of the expedition is the ascent of Everest. But besides that, as Prof. Norman Collie has said, there are some very important subsidiary objects to be attained. The whole country to the north of Everest is completely unknown. The maps we have are all very problematical, and where you see a range of mountains marked in the map you may find it is a valley or lake, and as we go along we shall have to map our way. The Government of India have very kindly given us the loan of two officers of the Survey of India, both accustomed to mountain survey, and with them we shall have to work and map the whole of that country to the north of Everest, as well as the Mount Everest group; this alone would furnish a full summer's work. With these officers will be assistant surveyors, and a great deal of work has to be done. The Arun valley is probably quite wrongly mapped, and we are very doubtful as to the exact position of those ranges of mountains marked to the north of Everest. The draughtsman who compiled the map told me they were put in to fill up! Now Mount Everest is becoming known, like many other places at one time unfamiliar, as the island of Yap came into prominence a few days ago. I heard two ladies discussing the expedition recently, and at last one said to the other, "And where is Mount Everest?" "Oh, somewhere in Iceland"! Another remarked to me, "Oh, how very interesting your going to Everest! I hope you may get to the top, and then you may bring back a piece of wood from the Ark." We have a good botanist and naturalist, and there is every probability of our discovering many new flowers; but that very much depends on how far the monsoon currents penetrate up the Arun valley. It is extraordinary on those dry plains, which look so barren in the photographs, what beautiful flowers there are—most lovely rock plants, blue poppies, primulas, and all kinds of delightful flowers. There is also the geological work. We are probably getting either an officer or assistants from the Government of India for making a geological collection. We know there are a large number of animals up there. You get Ovis Ammon, one of the largest sheep in the world; possibly an antelope, certainly a gazelle, and partridges, and there is a great field for a naturalist. Some of the members of the expedition are leaving very soon, and we all hope to collect in Darjeeling in the middle of May, and to leave by the 14th. The Government of India is kindly giving us the loan of 100 mules for the expedition. This will be of the very greatest assistance to us, and we know now we shall have no difficulties with the transport. Lord Ronaldshay, the Governor of Bengal, is extremely interested in the expedition, and we are lucky in having him there. Colonel O'Connor is Political Agent in Sikkim, and his duties carry him right up into Tibet. He was with Sir Francis Younghusband in the expedition of 1904. It is, therefore, a specially favourable time for us to make this expedition, with so many

friends who will be quite ready to help us. There is a very elaborate photographic equipment going out with the expedition, so that we hope to bring back many records. Unfortunately the camera cannot reproduce the extraordinary beauties of colour there are in Tibet—greens, and reds, and orange, under a brilliant blue clear sky. It is a wonderful expedition, full of interest of all kinds, and when we come back I hope we shall have a very interesting tale to tell you.

The Mountaineering.

Mr. HAROLD RAEBURN, Leader of the Mountain Party.

Seeing that the political difficulties in connection with this expedition have been so happily overcome, we shall hope that difficulties of approach, that Prof. Norman Collie has described as very great, will also be successfully overcome owing to the careful organization of the transport, which is really the secret of getting a large party up there. There remain the mountaineering difficulties, and these will undoubtedly be extremely great. No one has ever seen the real approaches to Everest, because its lower slopes have been always concealed by the shoulders and slopes of its mighty neighbours. I do not think the northern ridge will prove at all possible, because I do not think anybody can live at such enormous elevations for such a long time as would be necessary. I was privileged last year, by very kind permission of the authorities of India and Nepal, to make a reconnaissance of Kangchenjunga, and I think in studying passages and probable conditions, we can, to a large extent, depend upon analogy. Great snow mountains are great snow mountains all the world over. These two great constellations of peaks, Everest and Kangchenjunga, at no great distance apart, are separated by an enormous river valley, the Arun, but probably conditions are very much the same. I think it very unfortunate indeed that for political reasons alone we are precluded from taking the easiest route from the south. We must find some sheltered face route, and I believe that the north east will be the most favourable, for this reason, that the north-west is probably much steeper, and it has the cold aspect. Now altitude and cold are the two great things we have to struggle against. If we can get on the north-eastern side we shall be much more likely to have sun early in the morning. As regards the actual mountaineering, everything will depend upon the training of the coolies, for I do not believe that Europeans can carry at these heights. Above 21,000 feet one has to have really well-trained and young active men, and support them in every way. We may take it that this year will be reconnaissance first of all, but there is no doubt we shall try to get as high as we can, for Italians and Norwegians are ahead of us at present in altitude records. We intend anyway to do our very utmost to explore this great mountain so far as may be possible, and to justify Sir Francis Younghusband's keen interest and able generalship which has rendered it possible.

Mr. Raeburn then showed and described some pictures taken on his reconnaissance of Kanchenjunga in 1920.

The Scientific Equipment.

Colonel E. M. JACK, Member of the Committee.

After all the interesting news you have heard I shall not bore you with a long list of scientific instruments that are being taken, but just tell you shortly what is being provided, with one or two points of interest in connection with the apparatus. We have taken, and are taking, every possible precaution to ensure that the best possible apparatus is obtained. Every precaution that critical examination and report by competent authorities can give is being taken.

We are sending one George mercurial barometer, with spare tubes. The only special point is that as it will not come into action until the expedition gets to high altitudes, we are having it made in a special form, with a much shorter column than usual. The aneroid barometers have, of course, to read to a great altitude. It is not convenient for an aneroid to read for more than 8000 feet in one revolution of the hand. Therefore they are being made in pairs, one to read from 15,000 to 23,000, and the other from 22,000 to 30,000. Small pocket aneroids are being provided for the climbers, and a larger pair as a reserve. The ordinary equipment of maximum and minimum thermometers and of boiling-point apparatus is being taken. Another instrument is a black bulb solar radiation barometer. We asked the views of the Meteorological Office about this black bulb thermometer, how high it should be graduated. The Meteorological Office gave it as their considered opinion that it ought to be graduated up to 220°. Later on Mr. Hinks met an official of the Meteorological Office, and was rather taken back by being told that in his opinion nobody but a fool would take a black bulb thermometer at all; so you see expert advice sometimes has its drawbacks. The optical instruments are one good telescope of new form, the micro-telescope, a good equipment of binoculars, and one or two monoculars. The photographic equipment consists of three stand cameras—one $7\frac{1}{2} \times 5$ and quarter plates—provided with tele-photographic attachments. The National Physical Laboratory, I should say, are giving every possible assistance in the selection. They have been very good in advising us and making a critical examination of the lenses we are sending them, and we shall be guided by their advice. A certain number of hand cameras are being provided: a quarter-plate hand camera, and a panorama camera, and small vest-pocket cameras. The vest-pocket cameras are for the high climbers. We are providing dark room equipment and the usual outfit in that way. I should mention that the plates for the expedition are being given very generously by the Imperial Plate Company. One word about survey. We are not providing any survey equipment at all, because the Survey of India have made

themselves responsible for all survey. It seems a peculiarly favourable opportunity for employing photographic methods. There are three principal ways in which they can be used to supplement the ordinary survey processes. The first is by photographs from the air: that method we shall not be able to use on this expedition, because it would have entailed the formation by the expedition of a special aerodrome, and the funds could not run to it. The second method is by the taking of individual photographs from fixed points on known bearings. That means the employment of a rather special form of camera. This has been used a good deal in Canada, and as Captain Wheeler, who is one of the survey officers, is a Canadian and we have heard he is getting apparatus in Canada and is an expert in photographic methods of survey, there is no doubt that that method will be employed on this expedition, mainly as a supplement to the ordinary method of survey. The third method is that of stereoscopic survey. Photographs are taken in pairs, on parallel lines at the ends of a measured base. The objects represented are slightly displaced in relation to each other, and by measuring the amount of displacement, and with your knowledge of the length of the base and the direction from which the photographs are taken, you can obtain the position and heights of the objects photographed. That is a very suitable method. Whether the Indian Survey will employ this method I do not know at present. An Indian Survey officer has employed the method in India, but he is not to be on the expedition.

Stores and Equipment.

Mr. C. F. Meade, Member of the Committee.

The most natural thing to do in discussing the equipment is to compare this with a Polar expedition, and there are one or two important differences. First of all, perhaps the most important enemy we have to contend with is the sun, and the sun at high altitudes is a very formidable enemy indeed. To cope with this we are having sunproof material to put over the tents, and we are using Whymper tents, with a double fly, which have been proved to be the best tent for high altitudes. Another great difficulty is that at the same time you are suffering, as it were, from chronic sunstroke you are undergoing danger of frostbite, and the boots, therefore, are by no means the least important item in the equipment. The pattern of ski boot is the best, as it gives plenty of room for the feet and for circulation. Covers are used over the boots to prevent them from coming into direct contact with the snow. One of the most encouraging pieces of news I have had is the account of Captain Morshead and Dr. Kellas, who reached the saddle of 23,500 feet on Kamet this year without any suffering whatever, and with normal appetites and pulses, which I think is a very exceptional performance indeed, and is most encouraging. The Bhotias are certainly some of the finest climbing material in the

world. Unfortunately they are not Buddhists, but very strict Hindus, and are limited by their religious prejudices about diet, which makes them difficult to cater for on the mountain. The question of food for the coolies is very important. Invalid diet is the best way to feed them: a diet suitable for convalescence, nourishing and appetizing.

Mr. Meade illustrated his remarks by pictures taken on his ascent to the saddle of Kamet in 1913.

The Natural History.

Dr. A. F. R. WOLLASTON, Surgeon and Naturalist to the Expedition.

It would be more easy to talk about the natural history of this expedition after we come back. It would have been much more easy to talk about it earlier in the evening. Prof. Collie has killed all my rats; Col. Bury cut most of the flowers; and Mr. Raeburn dug up the rhubarb; so there does not remain much for me. Both Mr. Raeburn and Col. Bury know the Himalayas very well, so that they are not so excited at the prospect of seeing the flowers as I am. Some of the most stolid of travellers have become quite lyrical in their descriptions of the flowers we are going to see—those fields of all sorts of beautiful things. I think, as a matter of fact, some of the most interesting natural history observations we shall bring back will be about the members of the expedition themselves—about their minds and bodies: their minds particularly. I have been told when you get above 16,000 feet the temper becomes very short. What it will be like when they have been to 29,000 feet remains to be seen. In a medical capacity I hope I shall have very little to do, so far as the members of the expedition themselves are concerned. They are a very sturdy, tough lot. In the matter of the natives of the country one may be permitted to hope that they may occasionally be in need of my professional assistance. Often it happens in these escapades that a few grains of calomel, a dose of castor-oil, or some quinine, will make you good friends who will provide natural history specimens, or even more welcome things such as mutton and goats. I ought to have begun by saying that the Director and others of the Natural History Museum are taking a great interest in this expedition, and through their help we hope to engage one or two native collectors and skinners from the north of India. The specimens will mostly, I suppose, go to the Natural History Museum, and such plants and seeds as we bring home are going to other people in consideration of subscriptions to the funds of the expedition.

The High Climbing.

Mr. GEORGE FINCH, Member of the Climbing Party.

Those of us who have been selected by Sir Francis Younghusband to make, under the leadership of Mr. Raeburn, the attempt to climb the highest mountain in the world, do not conceal from ourselves the fact

that we may expect to have to face great difficulties and dangers. I have heard a comparison drawn between this expedition and Polar expeditions. Such a comparison I have not found easy to draw. The Polar expedition is a long drawn-out struggle of several months. On this expedition remarkable difficulties are not likely to be met with below 20,000 feet. The ascent, however, of the remaining 9000 feet to the summit of Everest will, if at all, be carried out in ten days or even less, and it seems to me those days will be replete with concentrated effort and strain such as no other expedition has ever demanded. I do not fear our inability to piece out an ultimate route up the mountain. By possible route I mean a route which is not only climbable, but where we are more or less safe from the danger of snow, ice or rocks falling upon us. The risk of our falling ourselves I hope may be eliminated. The question is whether the conditions will allow us to follow the route selected to the summit. On a mountain of such an enormous scale we shall be able to avoid difficult rock climbing. But I think every one of us will have to call up all he ever knew about snow conditions. These, to my mind, will prove one of our main difficulties. I do not mean we need fear avalanches coming down on us, for no good mountaineer recklessly ventures in their path. The great danger will be that at altitudes such as we hope to reach, we may meet with conditions of snow such as none of us have ever seen, of such a dry and powdery nature that all our previous experience of the angle at which snow may be ascended, still less crossed diagonally, may go for nothing. As to the question of altitude, Mr. Meade actually camped at 23,600. Dr. Kellas and Captain Morshead reached the same place last year without feeling any inconvience. Indeed, Captain Morshead goes so far as to say he could have gone several thousand feet higher. I earnestly hope it may be my good fortune to be one of Captain Morshead's companions in overcoming the 6000 feet still to be made. Dr. Kellas has recently carried out a valuable series of temperature observations at altitudes varying from 15,000 to 22,000 feet. By a process of extrapolation one can calculate from these data that temperatures of $-60°$ F. are quite likely, indeed highly probable, on the summit of Mount Everest. In other words, the cold on this expedition will in all probability be Arctic in its intensity. That in itself may not at first be considered a very serious matter, but it must be borne in mind that at high altitudes which must be attained the rate of evaporation of moisture and the loss of heat from the human body will be far greater than at sea-level. One other question, and one which, as far as I am aware, was first recognized by Mr. Meade, is of great importance, and that is the effect of the exposure of the body to ultraviolet light. At high altitudes there are large quantities of ultraviolet light not kept back by the atmosphere. At low sea-level we are protected. Ultraviolet rays impinging upon the skin literally burn it, and the burning is followed by a feverish condition which hardly seems to me to be conducive to health and well-being.

Mountain Photography.

Captain NOEL.

I think that all the people who go out to the mountains can be divided into two classes, the real climbers we have heard talking to-night, and the others. I am only a mountain traveller. My journeys were prompted only by the love of the mountains in order to see and photograph them—to see their grandeur, and to bring back a photographic record. Now the real success of the mountain photographer depends largely upon his equipment. The portability of his instruments is a very important consideration. I myself favour the quarter-plate size camera, because with the modern lenses you can get the same definition as with the large old-fashioned cameras. Another point you have to consider is the provision of various lenses, so that you can get a photograph large or small without altering your view point. The problem in photography of snow mountains is this, that you have very large contrasts of light to cater for: the very bright blue sky, the white snow, and the clouds. You must use a yellow filter, to reduce the ultraviolet light, a slow plate of very great latitude, and give a long exposure. Then you have to use a developer which will give you a slow building up of the image. The last point the mountain photographer must consider is his position. A photograph may show correctly the sky, snow, and foreground, but lack atmosphere. The photographer has to turn the ordinary photograph into something more—a picture—and that is left to his individuality to try and accomplish. But on this point of composition I think you come against the limits of photography. I recognize that photography has its limitations, and in order to do full justice to the beautiful mountains in the Himalayas, and bring back a record of the wonderful colours and scenery, you really need an artist and his palette.

The PRESIDENT.

That brings our interesting discussion to a close. Before I close the meeting altogether I should like, in the first place, to disclaim the credit which has been so very generously given to me as regards the organization. All I have done myself is to crystallize an idea which has been in the minds of both the Alpine Club and this Society for many years past—this great idea of ascending Everest. We have heard a number of men of great experience and expert knowledge this evening, and I think you will have gathered that they are thoroughly aware of the enormous difficulties and dangers which they will have to encounter, but I hope you will see that we are making every possible preparation to discount all we possibly can by forethought, arrangement, and organization beforehand; and I hope you have also gathered that there is in the members of the expedition the grit, courage, and determination upon which success will ultimately depend. I do not altogether share these doubts about their being able to find Everest. I think they will find it

easily enough. Colonel Ryder at the close of our mission to Tibet went up to the north, and both he and Major Rawling described it as rising up by itself, and well away from its neighbours, 9000 feet above anything near it. On the one side was Makalu, about 14 miles off, but Everest stood up clear, and from it they described how lesser mountains gradually came away towards Tingri. I do not think personally they will have much difficulty in finding Everest. I agree with Prof. Collie about the extraordinary intricate nature of the actual approaches to the mountain when they get near to it. That is where the mountain party this year will find their difficulties, and where we depend upon them for making a thorough reconnaissance. You can depend upon these younger men to ascend as far as they can. I know you would all like me to thank Prof. Collie and the members of the expedition for the very interesting account they have given us this evening.

Note on the photograph taken by Dr. Kellas from a point about 16,350 feet near the Kang La.

In 1883 Graham climbed a peak in the neighbourhood of Kabru, from which he had somewhat the same view as that shown in the photograph. He described a snow peak and a rock peak as clearly seen "towering far above the second and more distant range," and "showing over the northern slope of Everest." These may have been two of the cluster of lofty peaks north-west of Everest numbered T 45, T 57, B 782, T 42, and B 783, which have been located by the Survey of India but are not visible in the photograph. On the other hand Graham may have meant that the peaks appeared over the northern ridge connected with Everest, and his peaks may be the two shown in the photograph and lettered A and B.

The snow peak A is perhaps over 25,000 feet, and the splendid rock peak B rising behind the further range may be even higher than A, as it is considerably further off. Through the telescope it appeared as a magnificent wedge of light-coloured rock flecked with snow.

The photograph also shows a snow ridge connecting the south-eastern arête of Mount Everest with Makalu through a great rock peak lying between the two. This peak is not in Burrard's List of Summits, though it is about 25,000 feet and is clearly seen from Sandakphu. An unknown snow peak about 24,000 feet with a peculiar crater facing north-east, is seen on the ridge connecting Makalu with the peak N 53. It seems that the whole eastern face of Mount Everest must drain to the Arun through a glacier passing north of N 53.

From other photographs taken on the summit of a peak of 17,400 feet a considerable prolongation of the nearer range is shown, and the cessation of high peaks immediately north of this seems to indicate that most of the unsurveyed lofty mountains lie north-west and north of Mount Everest. Behind the magnificent rock peak lettered C, north-west of peak

N 53, there appears a prolongation of the Mount Everest ridge running to the range that leads to A, which peak seems to be less than 25 miles north of Mount Everest. It may be that this is the "rounded dome" seen by Sarat Chandra Das from about the Semo La and mistaken for Mount Everest. The black rock peak C is the peak seen by Mr. Freshfield and photographed by Signor Sella from the Chunjerma La, but it seems to be east of Mount Everest and not north-west as they supposed. Immediately to the right of this peak the photographs show a fairly low col in the ridge leading to A (the lowest for a long distance), and beyond the col is a precipitous very lofty ridge which must be connected with the cluster of great peaks north-west of Mount Everest mentioned above. The snowy peaks of moderate elevation to the right of the photograph reproduced appear easy to climb and readily accessible from the north; they cannot be far from Tingri.

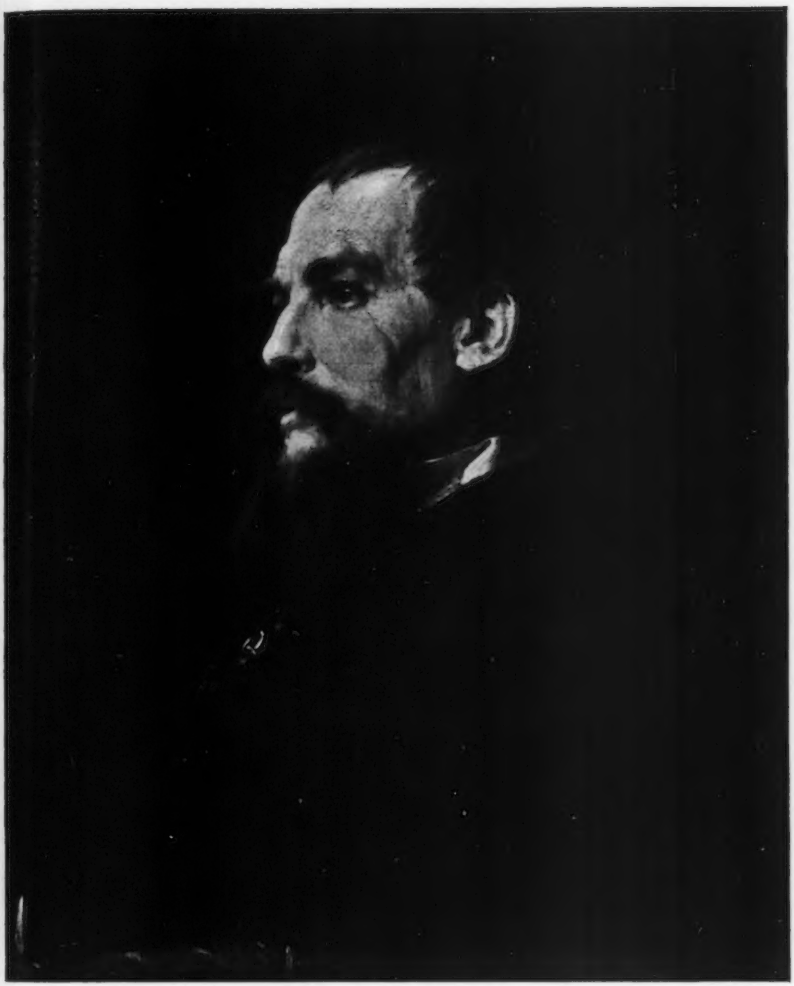
Dr. Kellas does not name the valleys. That in the immediate foreground would seem to be one of the eastern affluents of the Tambor, the deep valley in the middle distance the main valley of that river. The gorge of the Arun lies beyond the next range of peaks close under Makalu and N 53. In examining this photograph one must remember that it was taken in December, and that the country between Mount Everest and Tingri through which the Mount Everest expedition must advance will probably not carry so much snow in June or appear so formidable as in this photograph.

SIR RICHARD FRANCIS BURTON

Born 19 *March* 1821.

IT is difficult for me to realize that more than thirty years have passed since the death of my old friend Sir Richard Burton; his powerful personality and aggressive vitality seem but a thing of yesterday. Nature, in fact, had intended for him a much longer span of life; but even his iron constitution was not proof against the hardships of exploratory travel and reckless disregard of his own health. I remember his telling me that when, after parting from Speke, he arrived, wounded, starving, and deserted, at the first depôt which had been provided for the explorers, he found there nothing but a few bottles of spirits of wine for a lamp, and in his desperation he swallowed the whole of the contents of one of them.

He was one of the most learned men I have ever come across. Naturally it was more especially in the Oriental field that he was a sort of living encyclopædia. Here there were few questions to which he could not give more or less of an answer. But anthropology, archæology, even Etruscan inscriptions all alike interested him. It was not only



SIR RICHARD FRANCIS BURTON

From the portrait by LEIGHTON in the National Portrait Gallery, by permission of the Director

Arabic or Persian that he translated with a masterly hand, one of his lesser known works is a translation of the Lusiads of Camoens. The subject, however, upon which he chiefly prided himself and considered that he possessed a special knowledge was the history of the sword; unfortunately the first volume only of the exhaustive work which he planned to write upon it was ever completed. As regards languages, Burton combined linguistic facility with philological knowledge, a combination which is by no means common. In setting to work to learn a new language, he once told me, he began with "the swear-words; after that everything was easy."

For the geographer his chief claim to fame rests upon his Somali journey in 1854, when he was the first white man to enter Harar, and more particularly on his explorations and discoveries in Central Africa. But to the world in general he is best known by his pilgrimage to Mecca in 1853, in the disguise of an Indian Pathan. He was the first Englishman to enter the holy city of the Mohammedans, and the first European who has gone there with a thorough knowledge of Mohammedan history, beliefs, and ceremonies. His account of the Pilgrimage has rightly become a standard work of English literature. It was this pilgrimage that made him, next to Homer, one of Dr. Schliemann's chief heroes, as the doctor once confided to me. Schliemann's own ambition was to rival Burton's feat, and he spent a year at Alexandria with this object in view. Circumstances, however, prevented its accomplishment, and the only result was that Schliemann was able up to the end of his life to repeat the Qoran by heart. Shortly before Burton's death I was able to satisfy one of Schliemann's principal desires and bring the two together. As a *hajji* or pilgrim, Burton was free to travel wherever he chose throughout the Mohammedan world, and we once planned an expedition together along the northern coast of Africa, beginning with Tangier and ending with Alexandria. But at the moment we were both of us occupied with our professional duties, and when the more convenient season arrived it was too late.

Burton probably inherited his restlessness, versatility, and fondness for adventure from his Irish and Highland forefathers. He passed from Oxford to the Indian army, and then into the Consular service, much as he passed from one form of study to another. He was impatient of restraint on the part of those whom he considered inferior in knowledge or experience to himself, and in one instance at all events this had an unfortunate effect. He was removed from the Consulship of Damascus just when his profound acquaintance with the Oriental and the Orient was beginning to bear fruit. 'Unexplored Syria,' which he wrote in combination with Tyrwhitt Drake, shows what he might have accomplished had he remained longer at his Syrian post. For once in a way a Consulship could have been made subservient to the advancement of scientific discovery and research.

A. H. Sayce.

AN IMPORTANT ATLAS IN THE BRITISH MUSEUM

E. C. Abendanon

AMONG the valuable and perhaps not enough known atlases of the British Museum there is one that deserves our special attention. It is catalogued under No. 1513 Bibl. Egerton. On the first page of the fine modern binding of this atlas one reads: "The title written in ink on the original parchment binding, was, as far as could be read, 'Livre de la marine de * Pilote Pasterot,† l'an 1587. F.M.'" As a fact the title is most indistinct, especially as to the name, but the 8 of the number (year?) cannot be misinterpreted.

Harrisse twice quoted this atlas. In 1892 ('The Discovery of North America'; London and Paris, 1892) he wrote about it:

"A Portolano, of seventy-eight charts of the coasts of both hemispheres, drawn on a plane scale; with pen-and-ink drawings of cities, fortifications, native inhabitants, animals, and vegetation. The original pencil outlines are visible under the ink. At the end of the volume are original letters of Charles IX of France, exempting Nicolas du Tour, Sieur de Couldray, from the billet of soldiers; dat. Rouen, 16 Aug. 1563."

Then again, in 1900 ('Découverte et Evolution cartographique de Terre-Neuve et des pays circonvoisins,' p. 263; London and Paris, 1900), he mentions it:

"Quatre années s'écoulent et, en 1587, un pilote appelé Pastoret, d'ailleurs complètement inconnu, construit un bel atlas de soixante-dix-huit cartes, en France, mais sans qu'on puisse dire dans quelle ville."

To these descriptions (and others have not come to our knowledge) we may add the following particulars. All the maps of this atlas distinctly want a finishing touch. There are many duplicates and triplicates, but only one of two or three identical representations of coasts has been supplied with geographical names. All maps contain the indications of north and south latitude in degrees. Moreover, all maps are divided by two sets of quadrangles, one standing upright, the other at an angle of 45°. A circle has been drawn round all of them. The seas of these maps are especially livened by very finely drawn sailing vessels, sometimes by monsters of the sea. On the land we see mostly trees, tents, castles, or houses, and more seldom human beings or animals.

In all these respects the maps of this French atlas differ from the well-known Desceliers and Desliens maps of the Dieppe cartographic school. But as we have learned to consider the Dieppe maps, especially for the cartography of the East Indian archipelago, as the missing milestones ‡ in the historical development of its early cartography, so our

* Ought to be *du*.

† In the catalogue itself the name is written "Pastoret."

‡ "Missing links in the development of the ancient Portuguese cartography of the Netherlands East Indian archipelago," the *Geographical Journal*, 1919, p. 347.

thought was that a comparison of the atlas attributed to Pastoret and the world-maps of Desceliers and Desliens might teach us, if not the year of that atlas, at least the state of the cartographical knowledge represented by it. These mappemondes are the Harleian (1536?), the Desliens map of 1541, and the Desceliers maps of 1546 and 1550.

For this comparison it is not necessary to look at the coast-lines of Africa, but we have to study those of the afore-mentioned archipelago, the south part of the Indian Ocean, and the coasts of North and South America.

Folio 4 of the Egerton 1513 atlas, as we will call it henceforth, contains a "partie delaterre de linde occidentalle" in a very old-fashioned way, namely one of the end of the fifteenth century. "Isle Zipango" (= Japan), "Isle St. Lazare," "Ziloly vel silloly" (= Halmahera, much too big), "Timor," and "aubenon" (= Ambon), all put too near to one another, form a mixture of cartographical fantasy after data which had their origin in the times shortly before and shortly after the arrival of the first Europeans in the East Indian archipelago. One may presume that this map was meant by its constructor to be considered as a piece only of historical value in his time.

Folio 55 contains the map of the East Indian archipelago without a title.

The north coast of Java, which island is connected with the large imaginary South land, is almost the same as on the Harleian (1536?). In the eastern part occur two deep south-extended bays, separating a north-south peninsula with the name of "Simbana" (Eg. 1513), or "Symbana" (Harleian), and a long north-south island with "C: dafrelles" (Eg. 1513), or "C. de flones" (Harl.). East therefrom we see "entree de solœc" or "Lentree de soLoç," and still more eastward a triangle-shaped "Tmor" or "Timoros." A series of small islands leads on both maps to the island * of "Seillam" or "Seillan," and a second series of small islands, a little more to the north than the first, leads westward back to the island of "Amadura" (Eg. 1513 and Harl.). The conception of the island of Halmahera on both maps is very much the same, and so it is for the first embryonic representation of Celebes. The differences belong, firstly, to the north-west coast-line of the latter island, which is not shown on Eg. 1513, and is given, approximately, on the Harleian; and secondly, the name of "celebis" (Eg. 1513) or "C: des Sselebres" (Harl.).

North of Celebes is drawn a large west-east island, with the name of "mandano" (Eg. 1513, no east coast) or "mindearao" (Harl., hypothetical east coast). North of this island of Mindanao, three others are drawn near to one another and stretching nearly south-north (Eg. 1513, without north coasts; Harl., with hypothetical north coasts). To the west of these three islands stretches the south-eastern coast of

* East of this island both maps give blanks.

"palabecara" (Eg. 1513), viz. the island of Pelawan; the same island with roughly outlined south-western, north-western, and north-eastern coasts on the Harleian mappemonde.

South of this island of Pelawan, Eg. 1513 contains the whole island of Borneo (without name) with the name of "port de bormio" and "mont S: pol" in the north part. The Harleian map contains only the north-west coast of Borneo (the well-known Spanish discovery of 1521 of the famous Magalhães expedition), whereas the north-east, south-east, and south-west coasts are merely roughly outlined. This difference in the large island of Borneo is most peculiar, for it forms the only real cartographic advance in the archipelago of Eg. 1513 on the Harleian. As a fact, the draughtsman of Eg. 1513 refrained from drawing coast-lines where they were not known,* whereas the draughtsman of the Harleian (Pierre Desceliers) evidently wanted an island to be drawn as an island.

If we now turn to the Desliens mappemonde of 1541, we immediately remark many cartographic amendments. Flores and "timor" have become east-west islands. Halmahera has slightly but distinctly improved; so has "midartaõ" (= Mindanao), and have the three islands north of it. Pelawan has no more than its south-east coast. But "borne" (= Borneo) and Celebes (without its name) show great cartographic improvements.

The Desceliers mappemonde of 1546 equals, in its cartography of the East Indian archipelago, that of Desliens in nearly every respect. But of Pelawan, once more, as in 1536 (?) on the Harleian, Desceliers gives the imaginative south-west, north-west, and north-east coasts. It is clear that, in the cartography of the East Indian archipelago, the Eg. 1513 atlas represents the cartographical knowledge from slightly after 1536, but before 1541.

We have still to mention fol. 56 of Eg. 1513, containing the north part of the archipelago and the sea north of it to the south of Japan. It represents the same piece of coast-line for the island of Celebes with the name "celebis" or perhaps "celebre." Fol. 61 of the Indian Ocean stretches eastward to the west coast of the "Isle de bornio." North of the Philippines the ocean remains open on the maps of 1536 (?) and 1541, but is bounded by a concave-shaped coast on Eg. 1513, wherein we see a little island "Zapinga" (= Japan).

Turning to North America, we have on fol. 8 of Eg. 1513 a map of the "Terre dv Laborator." The coast-line closely resembles that on Desliens' map of 1541, but differs in many respects from the Desceliers' maps of 1536 (?) and 1546, which are nearly alike. At the latitude of 45° north, Eg. 1513 reads: "La grand baye. oupassa le capp: Jacq. caretier, Euuoye par le Roy francois premie. por descouurir canada."

The north coast of N. America further on is nearly the same on the

* Except as regards the imaginary South continent.

one Desliens and the three Desceliers maps, but slightly different on Eg. 1513. As for the coast-lines round the Gulf of Mexico, Eg. 1513 and Desliens (1541) go together and are different from the three Desceliers, which are much alike. On fol. 24 there is written west of the peninsula of Florida: "Baye de Jehan ponce." *

As for the north part of the west coast of S. America, there is again a pronounced resemblance between Eg. 1513 and the Desliens (1541) on one side and between the three Desceliers on the other side. The difference between these two ways of drawing that part of the coast is remarkable. It seems thus that for the whole of Central America there is a distinct affinity between the Eg. 1513 and the Desliens map of 1541.

Fol. 12 represents the north coast of S. America up to the "Isle de la trinite" and the "Grande riuiere des Amazones," then it turns first to the south-east and then only to the east. This is the coast-line of the "Terre des caniballes." Desceliers 1536 (?) gives "La trinite," but no mouth of Amazone river; the coast of "Caniballes" runs directly to the east. So Desliens draws in 1541 this same coast east of the Amazon river. Even in 1546, Desceliers does not give much of this river and leaves the coast east from its mouth running to the east. Only on his map of 1550 does he clearly draw the Amazon river, and east of it the coast-line first runs to the south-east, then east, as in Eg. 1513. It is most remarkable that on this map of 1550 by Desceliers, the uninterrupted coast-line has been retouched and taken away so far as to allow the Amazon to flow out freely into the sea.

For this part it would thus seem that the draughtsman of Eg. 1513 had cartographic information of about 1550. But he might also have been better informed on that part of the S. American coasts than Desliens and Desceliers. For in general the coast-line of the south-east part of S. America again is nearly the same on the Harleian of 1536 (?) as on Eg. 1513, both showing a square enlargement of the continent towards the east that is absent from the Desliens' map of 1541 and the Desceliers' maps of 1546 and 1550. Evidently for this coast too the cartographic knowledge improved just before 1541. About the La Plata river we can mention that "Les rivieres de Prata" on the Harleian 1536 (?) are not so well drawn as the "Riviere de Plate," "Riuiere el paranna," and "Riuiere elle paragner" on Eg. 1513, which in this respect is nearly like the "R. de Plate" of Desliens (1541) and the "riuiere de plate" of Desceliers in 1546 and 1550, the latter containing again the names "parana" and "paragan."

The east coast of Brazil on Eg. 1513 being thus almost the same as on

* This name is most probably that of the well-known French navigator and explorer of the coasts of America, called Jean Alfonse. In the years 1543–44 he wrote a book on Cosmography, and the writing is quite different from that in the Eg. 1513 atlas. It is therefore not probable that he was the maker of that atlas; besides, he would not have written his name badly.

the Desceliers of 1536 (?) and not so good as on the maps of 1541, 1546, and 1550, and the La Plata river being better than on the map of 1536 (?) and nearly equal to that on the three last-mentioned maps, it is once more quite clear that the cartographical knowledge represented by the Eg. 1513 atlas dates from between 1536 (?) and 1541.

There is another very remarkable feature in the Eg. 1513 atlas, namely the very developed coast-line of the imaginary Southern continent. Many names of rivers, bays, and capes are given; on fol. 36 we see the "Terre australle" with two sailing-vessels which fly white-red-black flags, "Nauires descouurans les terres." Now the Harleian mappemonde (1536?) has no Southern continent, but it is represented on the Desliens map of 1541 and the Desceliers maps of 1546 and 1550. It gives one the impression that the draughtsman of the Eg. 1513 atlas was the inventor of the South continent, and that Desliens and Desceliers hesitated to follow him in his cartographic imagination, although on the other hand they did not dare to neglect that famous and much spoken-of South continent. Here again the Eg. 1513 atlas dates itself between 1536 (?) and 1541.

Another fantasy, equal on all the maps in question is "Zanzibar: ysle des Geantz" (Desceliers 1536?) = "isle de zanzibar peuplee de geans" (Eg. 1513) = "Isle des geantz" (Desliens 1541) = "Y: des geantz:" (Desceliers 1546) = "Zauzibar" (Desceliers 1550).

To finish our comparative study, let us mention that of Madagascar there is not much to say. Its representation on the map of 1536 (?) is more primitive than that of the Eg. 1513 atlas, and this differs but slightly from that on the maps of 1541 (Desliens) and 1546 (Desceliers).

We must come to the conclusion that the cartographic knowledge represented by this French monument of map-drawing now preserved in the British Museum dates between 1536 (?) and 1541. Most probably the atlas was made in that time too, let us say about 1540. The maps show more affinity to the Desliens map than to those of Desceliers.

As to the clever cartographer himself we venture two suggestions.

Harrisse ('The Discovery of N. America,' 1892, pp. 622–623), writes about the map of Clamorgan as follows:

> "Map of the world made by Jean de Clamorgan, 'seigneur de Soane, premier capitaine de la Marine du Ponent,' and presented to Francis I.
>
> "'Ce grand Roy François qui receut de bon œil quelque chose du peu de scauoir qui est en moy, alors que ie luy presentay une carte uniuerselle en forme de liure, sus un poinct non accoustumé de la figure en plan du monde, où estoyent les mers et terres assises en longitude et latitude, car par une seule face ne se peut demonstrer ne faire sans grandes fautes. Et commanda mondit liure estre mis en sa librairie de Fontaine-bleau.'
>
> "It follows from this that it was a plane chart, with a new style of projection, crossed with longitudes and latitudes, and forming a sort of atlas. As to the date: 'circa 1536,' it is merely approximate on our part. Clamorgan must have been already in the French navy in 1529, as the

last prince whom he served was Charles IX., to whom he dedicated the *Chasse du Loup*, where mention is made of his having occupied an important naval post for forty-five years: 'L'espace de quarante cinq ans qu'ay exercé l'estat et charge de la marine.' The map was presented to Francis I., who died only March 31, 1547; but, as Clamorgan spoke therein of Canada as a recent discovery: 'car voyant le beau commencement que continuez de descouurir la nouvelle terre Françoise, Canada, Ochelaga et la Sagueue (Saguenay), sera baillé moyen plus aisé à tous de faire ladite nauigacion,' we infer that Clamorgan's map must have been constructed very soon after the first voyages of Jacques Cartier.

"Although the greatest part of the Fontainebleau library has been preserved, and Clamorgan's map still figures in the inventory of 1682 (No. 6815), that monument of the early French cartography has disappeared. Another work of his, viz. *Traité sur la construction des navires et sur les navigations lointaines*, which may have contained some notice of the voyages of Verrazano and Cartier, is also lost."

There are several facts which seem to make it possible that the Eg. 1513 atlas is the lost atlas of Fontainebleau. The name of Clamorgan however is quite different from that of Pastoret, albeit that this name is very indistinct and difficult to read.

Anyhow, there is reason for another suggestion. According to Harrisse ('Découverte . . . de Terre-Neuve,' 1900, p. 173), Jacques Cartier left France on 23 May 1541, for his third expedition to N. America. Before he came back himself, he sent back Macé Jalobert and Etienne Noël, who arrived at St. Malo before the end of 1541. This name of Jalobert could certainly be read instead of that of Pastoret, and it would seem quite possible that this lieutenant of Cartier, who mentioned the name of his chief on the map of fol. 8, was the artist at St. Malo who, about 1540, made the famous atlas attributed to the unknown Pastoret.

MESOPOTAMIA AND THE WAR—REVIEW

My Campaign in Mesopotamia.— Major-General Sir C. V. F. Townshend, K.C.B., D.S.O. London: Thornton Butterworth, Ltd. 1920. 28*s. net.*

In Kut and Captivity.— Major E. W. C. Sandes, D.S.O., M.C., R.E. London: John Murray. 1919. 24*s. net.*

In the Clouds above Baghdad.— Lieut.-Colonel J. E. Tennant, D.S.O., M.C. London: Cecil Palmer. 1920. 15*s. net.*

With the M.T. in Mesopotamia.— Lieut.-Colonel F. W. Leland, C.B.E., D.S.O., R.A.S.C. London: Forster, Groom & Co., Ltd. 1920. 12*s.* 6*d. net.*

War in the Garden of Eden.— Kermit Roosevelt. London: John Murray. 1920. 10*s.* 6*d. net.*

Marvellous Mesopotamia.— Joseph T. Parfit, M.A. London: S. W. Partridge & Co., Ltd. 1920. 6*s. net.*

Wanderings with a Camera in Mesopotamia.— Alfred Vowles, F.R.G.S. London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd. 1920. 6*s.* 6*d. net.*

Mesopotamia as a Country for Future Development.— **A. B. Buckley.** Cairo: Government Press. 1919. *Price P.T.* 5.

A Dweller in Mesopotamia.— **Donald Maxwell.** London: John Lane. 1921. 25*s. net.*

THE question of our future policy in Mesopotamia can hardly be decided without reference to the events which occurred there during the war, and it would be well if some of those who advocate the abandonment of the country would study the more important of these volumes. They would then learn, among many other things, what strong motives of policy prompted the early occupation of Baghdad, and how those motives triumphed, at a time when military strategy should have been the guiding consideration, over the reasoned opinion of the practical soldier. They would be reminded of the enormous cost of that triumph and of the increased importance, after the first failure, of securing the political objective; and they would perhaps pause before they took upon themselves to advocate the treatment of a problem essentially imperial from a wholly local and temporary standpoint. Despite some centuries of intercourse, despite the knowledge of Western power and resource gained in the recent war, the traditional Easterner has not lost his traditional exclusiveness, and of all things most certain he still retains his Eastern mentality. In his view the conqueror remains because he is conqueror, and recedes only when and because he is conquered. Regarding Islam as one and indivisible, we may say, "What Baghdad thinks to-day Mohammedan India and Egypt will think to-morrow." Nor need any advocate of economy imagine that this is perverted epigram. If Turkey is no longer to be reckoned as a competitor for the allegiance of England's Mohammedan subjects, English influence in Baghdad must be maintained.

The miniature library of Mesopotamian fact and fiction which the great war has brought temporarily into your reviewer's hands can be divided, as were the Mesopotamian campaigns, into two groups. The dividing line is, of course, the fall of Kut el Amara on 29 April 1916. The first two and by far the best of these books deal with the first period, and the one from which the public will gain the most knowledge both of the earlier campaign and of the general atmosphere of the country is Major Sandes' 'In Kut and Captivity.' Heavy in style and perhaps overfull of detail, it yet towers above all the rest by reason of its obvious honesty and the consuming interest of its subject. It acts as a human corrective to General Townshend's technical apology, and when the battle is over and done the author remembers the wounded and the stricken and traces their various wanderings, most of them, alas! to the bitter end, but some of them more happily to final liberation. General Townshend's book is a record of military decisions and plans carefully noted down at the time with a view to future publication. As a military text-book it will rank high, and it will appeal to students of military science more than to casual readers. To the lay intelligence his exposition of Napoleonic principles will appear unduly laboured, and the magic expressions "minimum force" and "principal mass" become tedious when repeated *ad infinitum*. General Townshend's battles were well planned; his organization was such as to make the first preparations of the Indian Government seem fantastically inadequate; his objections to the advance on Ctesiphon are clearly proved; and his defence of Kut was maintained skilfully and successfully until the latest possible moment. But General Townshend's claim to have brought about peace with Turkey may be dismissed as the soaring of a mind suddenly freed from the strain of captivity. The Turks did not approach him until the game was up, and clearly they hoped by

treating him so much better than his compatriots in their hands to convert him to their point of view, in the mistaken belief that his representations of their good intentions would carry weight with the British Government.

In following the fortunes or misfortunes of the prisoners of Kut Major Sandes has a lamentable tale to tell. By comparison with that of the other ranks the lot of the officers was tolerable, if at times hard to bear. The fate of the wretched men was callous and cruel, almost beyond description. Their treatment was that of slaves, and three-fourths of them perished. How they were left in thousands by the wayside and in hospitals from which the simplest elements of humanity and medical science were absent is, or should be, now well known. No one, however, will find his time ill spent in refreshing his memory and his knowledge from Major Sandes' book. A noteworthy fact is that, according to Major Sandes, such small consideration as these unfortunate men received was due to German officers. Their ill treatment came from the Turk, and Enver Pasha, who was on the scene when the march of death was taking place, is the person in authority chiefly to blame. General Melliss, who travelled in the rear of the straggling procession, was able, by distributing money and sometimes medical aid, to contribute something towards the relief of these hapless sufferers. As between Turk and German General Townshend does not agree with Major Sandes, but his opportunities of judging, having regard to his speedy progress to Constantinople, were not so good.

The history of the second phase is less fully written. Its hero was General Maude, whose untimely death deprived him of the opportunity to write and others of the opportunity to read a first-hand account of his remarkable campaign. Brilliant as were his victories, eclipsing the finest achievements of the earlier phase, it is to be observed in fairness to General Townshend that the successes and failures of the first campaign were recent experience from which he could draw, and they must have been of material assistance to him in achieving his results. Mr. Kermit Roosevelt, Colonel Leland, and Colonel Tennant all write of the second period. Mr. Roosevelt writes as a free lance in an amusing strain. He was a captain in the motor machine-gun corps, and his book is a record of experiences, chiefly his own, and is replete with anecdote and incident. The descriptions are good, and the reader will gather a very comprehensive view of the conditions of campaigning in the country. Colonel Leland sticks rigidly to his title, and, unlike Mr. Roosevelt and Colonel Tennant, writes with a sense of responsibility. His book should be of use to any M.T. officer who is preparing for the next war. On one occasion, when ordered to supply a column in Persia nearly 300 miles from its base, he discovered that the full carrying capacity of each vehicle was exactly exhausted after loading the fuel necessary for the journey there and back. The reader may be left to discover for himself how Colonel Leland solved the problem. Colonel Tennant regards his title as of quite secondary consideration. The author followed General Maude almost as a member of his staff, and regards the Air Force very much from the point of view of any other staff officer. Throughout the book, which is very readable and suggests the style of an accomplished Press correspondent, the Air Force takes quite a secondary place, and the chief value of the book is to give the reader an idea of General Maude and a picture of the country and the campaign.

Of the remaining works little need be said. Mr. Maxwell was an official artist with the Mesopotamian force, and his book contains many charming sketches in colour, monochrome and line, as well as some admirable descriptions of the country. A pleasanter memento of the campaign cannot be

imagined. Mr. Vowles has produced a useful little handbook of the country, amply illustrated with photographs, as are all the books except General Townshend's. Mr. Buckley's pamphlet is an official collection of maps, with some valuable notes on irrigation and agriculture. Mr. Parfit is apparently a missionary who knew the country before the war. His record of progress since the British occupation, if even half true, justifies our remaining in the country. His political views will, however, find little support, and when he attempts to record military events, few, if any, of which he witnessed, he makes the mistake of writing upon a subject of which he lacks adequate knowledge.

In conclusion, it seems worth while to repeat that the political reasons for the occupation of Baghdad in 1915 are not less potent to-day, and to hazard the conclusion that if they were strong enough then to warrant the sacrifice of the sixth Indian Division, they are strong enough now to justify the additional expenditure necessary to maintain British influence in the country. Nor can it be doubted that Mesopotamia is capable of nearly as rapid development as Egypt, and that its potential resources of raw material are far greater.

E. H. K.

REVIEWS

EUROPE

The Place-names of Northumberland and Durham.— Allen Mawer. Cambridge University Press. 1920. 20*s. net.*

THE bulk of this work (Part I.) consists of a glossary of place-names, for each of which the sources are given and explanatory notes added. Part II. gives elements found as the second part of place-names, or used by themselves, and Part III. personal names found as the first element in place-names. Finally there is a short section devoted to phonology.

The author's general exposition of his subject is limited to a brief introduction in which he deals with: (1) The names of the counties and their divisions: here it is remarkable that no trace is to be found of the word "Bernicia," the ancient kingdom which covered practically the whole area in question. (2) The Celtic, English, Scandinavian, and French elements in the place-names of Northumberland and Durham. The prevalence of the Celtic element is very much as elsewhere in England: the river-names are uniformly Celtic, and many names of towns, villages, and farms also. The author infers from the absence of any increase of Celtic names in the west and north-west borders that the Anglian conquest was complete. This inference is supported by the fact that the vast majority of the place-names are of Anglian origin. His conclusions regarding the Scandinavian element do not give much support to the not uncommon belief that the population of Northumberland has a strong Scandinavian strain. "Northumberland and Durham are not counties," says Mr. Mawer, "in which the evidence for Scandinavian settlement is strong. . . . The general distribution of these names compels us to believe that such Scandinavian settlements as there may have been were made by men arriving either from the sea and moving up the great river valleys, or to some extent at least by men moving up from more southerly and more distinctively Scandinavian districts. There is no evidence which could support the idea of an influx from the west, either from Cumberland or from south-west Scotland—Dumfries and Galloway. Further, there may have been very extensive ravagings of the two counties by Viking invaders, but there was,

on the other hand, no definite and permanent parcelling out of the land of these two counties among alien settlers who had ousted the old Anglian population from their farms."

The smallness of the French element would appear to indicate that the direct effect of the Norman Conquest was not great. It is seen in the names of manors to which the holder's name was added, as, for example, in Seaton Delaval.

There is a full and very valuable bibliography. The long and laborious study the author has given to his subject must put under obligation every student of place-names. The general reader will only regret that he did not extend his interesting introduction further and illustrate his researches with a map. E. A. P.

Records of a Scotswoman. Katharine Stuart Macqueen: a Memoir and Account of her Work.— Olive Maclehose. Glasgow: Maclehose, Jackson & Co. 1920. *7s. 6d. net.*

The chief interest of this book to readers of the *Journal* is that it contains accounts of two journeys to the Balkans, one made in 1912–13 under the Macedonian Relief Committee, and the other, also on relief work, to Albania, in the spring of 1914. The letters and diary describing these two journeys show Miss Macqueen to have been a practical and efficient woman, with a full realization of the dangers inherent in a policy of distributing doles and leaving the cause of the need for these untouched, and the Albanian journey especially, which she herself regarded as a tragic failure, throws much light both upon the difficulties of helping the Balkan peoples and upon their problems. It is curious to note that after her return from Albania in May, 1914, Miss Macqueen proposed to go back with the idea of starting some form of model commercial undertaking in Serbia or Albania. During her visits also all her efforts were directed towards aiding the people in developing the natural resources of their country. In Macedonia she found the Christian women far more energetic and hard-working than the Turkish community, and not unwilling to respond to her attempts to make them independent. The conditions in Albania, on the other hand, struck her as singularly hopeless, and there is not a little to be learnt from her pages about the short-lived principality. The accounts given of the futile but well-meaning attempts of the "Queen" to do her duty and carry out her part are full of humour, and the people, no less than their nominal rulers, continually suggested a combination of 'Ruritania' and 'Alice in Wonderland.'

Even the distribution of alms in the villages was not without its difficulties, on account of the tendency of those whose names had been omitted from the mayor's list of necessitous persons to depose that functionary and fight the favoured parties for the plunder.

In regard to "atrocities" there is a saying so pregnant with wisdom as to merit quotation in full. Speaking of accounts of Turks in Macedonia being shut up in mosques and burnt to death, Miss Macqueen says, "Curiously, the description of what happened tallied almost exactly with one I had heard of a church in a village in Ross-shire where three or four centuries ago the Frasers came down and burnt the Mackenzies, playing the bagpipes round the church as they blazed! If we are to understand these people we have to think ourselves back several centuries." M. I. N.

The Danube: its Historical, Political, and Economic Importance.— Dr. Henry Hajnel. The Hague: M. Nijhoff. 1920. Pp. 167. *Price 6s.*

The title of Dr. Hajnel's book is rather misleading, for it is practically confined to the subject of international law—with special reference to the Danube. The first part of the book (pp. 1–53) discusses general international trade and international law, general river navigation, and the general effects of the Vienna Congress, and then devotes fifty pages to the Danube. The second part professes to deal with the "Danube as Waterway," and does give some details about actual voyages, etc., on the river—before and after the introduction of steam-power. The last chapter even contains some interesting statistics about the Danube tonnage at various intervals between 1856 and 1913, *e.g.* figures which show the rapid increase in Bulgarian tonnage from under 400,000 tons in 1908 to over 600,000 in 1912. On the whole, however, the book is entirely lacking in geographical interest.

The historical and legal merits of the book are great, and it is all the more acceptable because free from the quibbles and lack of common sense which have marred the works of several other Dutch writers in recent years. For instance, on p. 7 Dr. Hajnel almost implies that he agrees with the Vienna Congress in accepting as international any "navigable rivers which either separate two states or flow through two or more states"; and later (p. 48) he draws attention to the incompleteness of Klüber's 'Acten des Wiener Congresses,' from which most writers on the question borrow so largely. His attitude to "the Feudalists" (p. 8) is most welcome, as is the inference from his discussion of the Ferrara Pact of 1177 A.D. (p. 9) that the first treaty about International Rivers was essentially geographical, not legal, *i.e.* that "International Rivers" is *not* "a notion which belongs purely to International Law." Similarly, on p. 25, he ungrudgingly allows to France, through the Revolution, full credit for making "a landmark in the history of the navigation of rivers." The book is admirably printed, but one bad misprint has crept into p. 108, where Trajan's victories in Dacia are dated "107 *B.C.*"

L. W. L.

The Turks in Europe: A Sketch-study.— W. E. D. Allen. With a preface by **Brig.-Gen. H. Conyers Surtees, C.M.G., D.S.O.** London: John Murray. 1919. 10*s.* 6*d. net.*

The book, described as a "chronicle of man's savageness and meanness," s divided into four chapters, dealing respectively with the periods 1288–1566, 1566–1792, 1792–1871, and 1875–1914. But the first two chapters are short, and by far the greatest amount of space is given to the modern period, that which has been most fully discussed by recent authors. There is no list of authorities, and the comparatively small number of footnote references are mostly to recent books, and even so are in several cases scarcely full enough to make access to these easy. There are two useful coloured maps, and a good index, as well as a Chronological Table of the chief events in Ottoman History.

The book forms a useful short summary of Turkish history, though from our point of view it would have been improved by some consideration of the effect of geographical conditions on history. Its author also makes no attempt to adopt the historian's detached attitude towards all forms of human activity; the villain of the piece is only secondarily the Turk and primarily "Man, not wicked but stupid, always stupid!" "Intolerance, savagery, callousness, exploitation, down through all the centuries to the twentieth century!"

M. I. N.

Der Salpausselkä.— Von I. Leiviskä. Mit 148 Abbildungen, 434 Profilen und xxvii. + 2 Karten. Helsinki [Helsingfors]. 1920. Pp. viii. + 388.

The Salpausselkä, outer and inner, are two lines of elevation in Finland, the former starting in the Hangö peninsula, and the latter in the Bromarf district, which is almost an island, being connected with the mainland by a narrow neck. The two ranges run parallel to one another throughout their course, at first in a north-easterly direction, and afterwards in great curves gradually turning from east to north-east and north. They present an interesting problem in glacial geology, which Dr. Leiviskä has studied with great care and thoroughness. With the help of his pupils he has examined the ranges and their structure in all parts, and in these pages records the results of his labours, illustrated by a map of the whole system, many sketch-maps of important sections, and very numerous photographs and profiles.

The forms are of great variety, broad-backed and flat-topped ridges being the most common, while plateaus are extremely characteristic of both Salpausselkä. Sometimes the range consists of two or more parallel ridges, sometimes it breaks up into hills and dales, and occasionally there are complete breaches of continuity. The ridges are of various heights, from a few dozen yards to 300 or 400 feet and more. With them are associated numerous åsar, especially between the ranges and within the inner Salpausselkä. Two main directions are noticeable, one parallel to the glacial striæ and at right angles to the range itself, and the other transverse to the direction of the movement of the inland ice. The material of which the ridges are composed is morainic débris and the fluvio-glacial deposits of the åsar are piled up on a structure of solid rock, which in some places rises up above these deposits.

It has for a long time been stated in geological literature that the Salpausselkä are marginal formations of the inland ice, and that they were built up during a prolonged period of rest on the retreat of the ice. Their origin, however, has not been treated as an independent problem, but has been explained by preconceived theories of the formation of åsar, the subglacial tunnel theory and the delta theory. It would take too long to set forth the arguments derived from his close observations by which Dr. Leiviskä shows that the Salpausselkä cannot have been built up by subglacial ground streams. His theory is that the material, or at least the greater part of it, has been transported in the ice, and when the ice thawed has been deposited or carried a short distance further by the water from the melted ice. Nor can the plateaus, which often extend unbroken for several miles, have been piled up by separate streams; in general they mark the upper limit to which effective action of the sea has reached.

Whatever climatic conditions prevailed when these accumulations were piled up, Dr. Leiviskä holds that they would not by themselves account for the long halt in the retreat of the ice. The varying heights of the uppermost terraces of the Salpausselkä indicate that the land was rising when these ridges were formed, and, as is well known, the upheaval was greater towards the north-west, so that at this period the rocky skeleton of the Salpausselkä was the boundary between the ascending slope from the basins of the Gulf of Finland and Ladoga and the almost horizontal plateau of the hinterland, and moreover between the sea and land, or, more precisely, between the deep and shallow water. From this configuration and the different character of the country on which the margin of the ice rested when it had retreated as far as the Salpausselkä Dr. Leiviskä infers that the ice must have made a long halt even if the climate remained unchanged. W. A. T.

AFRICA

Das Abflusslose Rumpfschollenland im Nordöstlichen Deutsch-Ostafrika.—**Dr. Erich Obst.** Teil I. (Mitteil. Geogr. Gesellschaft in Hamburg, Band XXIX.) Hamburg: L. Friederichsen & Co. 1915. *Price not stated.*

This work, issued from the press at Hamburg over five years ago, after the commencement of the war, has only recently reached England. It should be read in conjunction with earlier books, that of Dr. O. Reche on the Ethnography of the same region (1914), of F. Jaeger on the Highlands of the Giant Craters (1911), and of Bernhard Struck on the languages of the Tatoga and Iraku peoples (1911). In some respect the country covered by these German explorations and the works which describe them so well is to the man of science and even to the man of affairs the most remarkable part of (what was) German East Africa. It seems possible that the Iraku and Ilamba districts are the most richly mineralized parts of Zangia; considerable areas in Umbugwe, Umbulu, and Irangi had already, before the withdrawal of the German power, offered themselves to European colonization (because of their elevation, freedom from germ-diseases, water-supply, and fertile soil), and were studded with factories, mission stations, plantations, and mining centres. Ethnographically these countries lying to the south-west of Kilimanjaro and the north of Ugogo are of the highest interest, as they are also linguistically. Here you have scattered colonies of the Bantu speaking Bantu languages of importance in their relationships; pastoral tribes (Tatoga and allies) of Nandi stock related to the peoples of the Northern Rift Valley, and a much specialized branch of the Nilotic group; the Iraku, Fiomi, Wasi, and perhaps the Mbulunge tribes who are distantly allied to the Hamites in speech and partly so in physique (that is to say, related to the Gala and Somali); and lastly the Sandawi and Kindiga, whose language sabound in clicks and offer a slight resemblance in word-roots to Hottentot, and in phonology to Bushman.

This region, so curiously withdrawn from the other great watersheds of East Africa, sending its rivers neither towards the Indian Ocean nor to Tanganyika, nor to the Nile basin, but using them up in large and small salt lakes, in measureless swamps and vast depressions that were once shallow lakes in times of greater rainfall; of rift valleys and faults; of large, small, and even gigantic craters, the rims of which reach almost to snow-level; of conifer forests; of grassy prairies teeming still with game; of beautifully moulded hills and wooded valleys; of tumultuous rivers that flow for hundreds of miles and then sink into the ground and finish; of hot mineral springs; of phosphate and soda deposits: is deserving of the most minute research. Its dried-up lake-beds are believed to contain deposits of Pleistocene, Pliocene, and Miocene age which may yield evidence of an earlier mammalian fauna, or may elucidate the origin of the existing mammalian types of Africa, together with the evolution of the African forms of man. Here, seemingly, we have the birthplace of the Hottentot race, and perhaps a former home of the Bushmen and Strandloopers. There are traces of the Congo Pygmy embedded in such tribes as the Kindiga, who are living under the most primitive conditions, without agriculture or domestic animals and—until recently—without clothing. On the other hand, some of the finest peoples in physique and appearance still have their dwelling in these valleys and on the pleasant Iraku hills. Herein, so far as we are advised, the Germans governed well and had no troubles with the natives. When nearly all the rest of their East Africa had risen against them in revolt, the peoples of this self-contained watershed remained tranquil and friendly. How far this land of peace and progress suffered from the War we

have yet to learn. It is to be feared that in the conflict between the whites many lost their lives, and that much of the results of white colonization, industry, and research were accidentally destroyed.

It will behove us not only to restore what our predecessors achieved, but to go far beyond them in developing the inherent wealth of this wonderland; and at the same time to have the utmost regard for the native peoples with whose help we might make this region one of the richest and most productive parts of Africa. It is curious to note, by the by, that in former times, in the days of Zangian overlordship and the slave trade, the Zanzibar Arabs never obtained a footing here, nor did any influence of Islam penetrate; but that before the German rule came to an end Makua porters and workmen from the south had been making converts to Islam and building mosques.

The book under review and its associated literature ought certainly to be translated into English and put thus at the disposal of possible British immigrants. H. H. JOHNSTON.

The Handbook of Uganda.— **H. R. Wallis, C.M.G.** Pp. xxi. and 316. *Map and Illustrations.* Second edition. Crown Agents for the Colonies, London. 1920. *Price 7s. 6d.*

This is an official publication of the Uganda Protectorate Government. The author, who was for years Chief Secretary to that Government, deserves high commendation for having given in moderate space a comprehensive account of the Protectorate which is not only "up to date" but is eminently readable. In this edition chapters have been added on geology, botany, the part played by Uganda in the Great War, and on the work of the Christian Missions—to which work the progress of Uganda is mainly due. The present writer has subjected the Handbook to close examination and has rarely failed to find the information sought. It should be consulted by all visitors to and students of Uganda; residents in the country will scarcely need to be told of its value.

The account of the extension of "home rule" to areas where no dominant ruling tribe was found is particularly interesting. A more complete account of the working of the dual system of government, European and native, in the more advanced provinces, *e.g.* Buganda, would have been welcome; also a more precise account of the rights of Europeans to acquire land and measures taken to prevent the natives too easily parting with their patrimony. Fuller reference might have been made to the position of the Indian settlers and traders. The population and vital statistics given are by an oversight undated; they are for the year 1919. In the bibliography the place as well as date of publication should have been cited. These are points worthy attention in the preparation of a third edition. F. R. C.

In Wild Rhodesia.— **Henry Masters** and **Walter E. Masters, M.D., D.D.** Pp. 246. *Sketch-map and Illustrations.* London: Francis Griffiths. 1920. *Price 6s. net.*

This is an account of North-West Rhodesia, its physical features, flora and fauna, and its inhabitants, none the worse for being given in popular form and with many illustrations. The authors went to Rhodesia in 1905 as missionaries, and they discuss missionary influence and prospects with authority and with marked sanity. The book is also worthy of perusal for the picture it gives of a period that has passed—of pioneer life, travel, and adventure before the

coming of the railway. It is very brightly written, and the chapters on native customs and mentality show not only sympathy with the African, but an understanding too of the white man's difficulties. F. R. C.

AMERICA

The Governor and Company of Adventurers of England trading into Hudson's Bay during two hundred and fifty years, 1670–1920.— Sir William Schooling, K.B.E. London: The Hudson's Bay Company, Hudson's Bay House, Lime Street, E.C. 1920. Pp. 129. *With Illustrations and a Map of Canada showing the establishments of the Company.*

The Committee of the Hudson's Bay Company were fortunate to secure the services of Sir William Schooling as the eulogist of the 250th anniversary of the Company's foundation. He has produced a most readable, well-printed volume, which gives an attractive *résumé* of the Company's history. Unfortunately, the style of the illustrations is unpleasing and unworthy of a serious historical work; some of the reproductions of early documents and drawings are, however, of interest.

In some respects however the eulogy seems overdone. According to Sir William Schooling, "the seeds sown by the enterprise of the servants of the Hudson's Bay Company have led to the development of an ample and abundant life in ways that were never expected" (p. 10). To be sure, the Company from the financial point of view has been remarkably successful. Thus the original capital of £10,500 was increased in 1688 to £31,500, rose in 1720 to £94,500, to be made to £400,000 in 1821, until in 1863 it reached two million sterling. To-day it must be a very much larger sum. This success Sir William Schooling rightly attributes to the business acumen of the London committee; but there were other factors which would also seem to deserve mention.

When the Charter was first granted, no one had the remotest idea either of the tremendous width of North America, or that from the waters emptying into Hudson's Bay the Company's factors would eventually be led to the shores of the Pacific Ocean. Throughout this enormous area the Hudson's Bay Company has benefited more from the "ample and abundant life" of the inhabitants, both white and red, than from that of its own factors. Even Sir William Schooling is forced to admit (p. 80) that in neglecting the north-west coast, from which the Russian-American Fur Company drew in the thirty years previous to 1817 over two and a half million seal-skins, "the Hudson's Bay Company recognized too late the opportunities it had missed by failing to penetrate to the full limits of its chartered domain." Indeed, it has nearly always required the rivalry of a local Canadian competitor to stir the Company into any new enterprise. Thus the North-West Company, which has been called "the most terribly effective organization that has ever arisen in the New World" (p. 31), by its amalgamation with the Hudson's Bay Company in 1821 gave to the latter an energy which it sorely lacked. The same may be said of the more recent expansion of the Hudson's Bay Stores in the North-West. It was only the advent of enterprising Ontario rivals which forced the Hudson's Bay Company to develop this branch of its business.

The Company's servants in Canada have rarely been given any real liberty of action by the London Committee. In certain matters such as the brandy trade, the beginnings of which Sir William lays at the door of the North-West Company, this control has undoubtedly proved beneficial, but in the matter of geographical discovery it has worked to the disadvantage both of the Com-

pany and of Canada. The author gives the Company full credit for every act which helped discovery of which he can find any trace, but when all is said, the record of such a rich corporation in this direction is a poor one.

The truth is that the interests of the Company have lain and still lie in trade. Fortunately for it the demand for beaver has been a steady one. "The substitution of silk for beaver fur in the manufacture of hats in 1839," says Sir William (p. 49), "led to a great fall in the value of the fur, but this has been fully atoned for by its present extensive use for collars, stoles, and muffs." Similarly the busbies of the Hussars have kept up the demand for lynx. In their dealings with the Indians the Company's factors have invariably been fair, and as the author rightly states, "there has never been an Indian war in Rupert's Land" (p. 45). The Company has, of course, invariably looked after its own interests; and in the cession of its territories to Canada in 1869 made a bargain which it has never had cause to regret.

Sir William Schooling brings his book to an end with an interesting account of the Company's transactions on behalf of the French Government which were carried out during the Great War. The Company has hereby added another wonderful page to its striking annals which will always be remarkable for the success which has attended it as a thriving business Corporation.

Jamaica under the Spaniards: abstracted from the Archives of Seville.—**Frank Cundall, F.S.A.**, and **Joseph H. Pietersz.** Kingston, Jamaica. 1919.

The object of this work, to quote from the author's preface, was not so much to write a chapter on the history of Jamaica under the Spaniards, as to give some indication of the information contained in the Archives at Seville relative to this period of Jamaican history. That object has been abundantly attained. The book contains an abstract of a large number of documents—letters from Spanish governors of Jamaica, communications from the Crown to Jamaica, communications from royal officials, etc.—and shows the existence of a mine of material for the early history of Jamaica. It is not to be expected that a summary of a variety of State Papers should make either easy, intelligible, or consecutive reading, but some of the documents have been quoted at length and are of very great interest, as, for example, the account given by the Abbot of Jamaica of the state of the island in 1611, also the various accounts of the capture of the island by the English in 1655, and the subsequent struggle which lasted till 1660. But, valuable as the summary is for the information which it gives, or shows to exist, it might in one respect have been better done. It would have added very little to the length, and a good deal to the utility, of the book if a description in a few words, or short title, had been given to each document. As it is, it is often difficult for the reader to tell the nature of the successive documents which are summarized, or even where one ends and the next begins. However, one must be grateful for so large an addition to our knowledge, not only of Jamaica, but also of the early struggles of colonization and the growth of Spanish colonial policy. Jamaica was never very successfully planted. The Indian population became almost extinct, the Spanish settlers moved on, the towns decayed, the churches fell in ruins. But, none the less, its situation and its productivity marked it out as important. It was "a granary, warehouse, and military station," and its ultimate loss to England was a serious blow to Spanish power. Among the records of Jamaica in the Archives of Seville are eight maps, of which four are reproduced in this book.

E. A. B.

West Patagonien: Die Patagonischen Kordilleren und ihre Randgebiete.—Dr. Hans Steffen. 2 vols. Berlin: D. Reimer. 1919. Pp. 670. *With* 32 *Plates*, 67 *Figures, and* 13 *Maps. Price* 80 *M.*

The author, formerly professor at Santiago University, has carried out many important expeditions in Patagonia; he was the first to cross the Andes from the Pacific coast and to thoroughly explore the great river systems of the Yelcho, Puelo, Manso, Cisnes, and Aisen-Baker (or Cochrane), and he has also made other journeys in Southern Patagonia.

These substantial volumes are full of valuable information regarding the geography, geology, and climate of Chile south of 41° lat. There are numerous notes also on plant distribution, on those few aboriginal tribes which still survive, and on the economic prospects of this most interesting region, of which vast areas are still marked, even on the author's excellent maps, as "inexplorado." It is clear also that the literature of Patagonia has been carefully studied; even the journeys of the Jesuit missionaries in very early times are recorded, and their routes are traced wherever it is possible to do so. Any one, therefore, who wishes to make a thorough study of Patagonia must necessarily consult Dr. Steffen's book. We can here refer to but a few of the many important questions which are discussed by him.

Dr. Steffen appears to admit the usual theory that the whole west coast is a drowned land; also that the Moraleda channel is probably a continuation of the tectonic depression which is occupied farther north by the central valley of Chile. He continually protests, however, against the view that there is a central chain of the Cordillera and does not either explicitly admit or deny the existence of a similar, longitudinal, north-and-south tectonic depression east of the Andes in which lie the basins of many of the great lakes. This last meridional valley is postulated by Dr. Moreno, and we think by most of those who have discussed the question.

Dr. Steffen shows that the west coast as well as the mass of the Cordillera is dissected by "deep lines." One set of roughly parallel fiords or valleys being intersected by another series nearly at right angles produces a division into "blocks" which are well shown on his maps. An interesting sketch on page 416 brings out this arrangement for the district between 44° and 46° S. lat. Very great depths are found not only in the north-and-south channels such as the Moraleda (137 to 320 metres), but also in those more or less east-to-west sounds which are in continuation of the line of the river valleys (*e.g.* Cay canal 90 metres, Tuamapuka 250 metres). These observations appear to show that some of the greater rivers have submerged channels extending to near the continental shelf. Dr. Steffen believes in the theory of antecedent drainage, and supposes that the larger rivers managed to keep their valleys open during the upheaval of the Andes. But he does admit that the Pacific torrents have in many cases beheaded the Atlantic rivers.

With regard to the eastern tectonic valley, he points out that the basins of many of the lakes once extended over much greater areas than is the case at present. One could hardly, however, expect this valley to be recognizable all the way from Nahuelhuapi to the straits of Magellan, for there are huge districts covered by lava-sheets of two different ages, and there have been two periods (as Dr. Steffen shows) of great glacial activity, with the result that ice-age terraces and morainic matter make the original condition of the ground very difficult to follow. Dr. Steffen states that many of the east-to-west valleys are "trogformig," or trough-shaped in section, which he takes to prove that they have been finally cut out by valley glaciers.

Seeing that both Chile and Argentina have loyally accepted the boundary as drawn out by the commission under Sir Thomas Holdich, we fail to see what object Dr. Steffen has in continually finding fault with that award. The valleys which were then in question were of easy access from the Argentine side. No farmer or settler could possibly bring his goods to some very moderate harbour on the Pacific coast by such tracks as are very well described by Dr. Steffen himself. He himself enlarges on the unmitigated rain, frequent blizzards, rivers full of snags and rapids, carrying uprooted trees, and rising without warning into huge floods. The valley sides are steep, rocky and broken by landslides; the forest is often impenetrable or tied together by the climbing chusquea bamboo; the valley floor is frequently liquid mud often several metres deep. In such country as this communication with the west coast is economically impossible. Dr. Steffen's attitude towards the work of other, and especially of Argentine, travellers is inclined to be critical. Thus he did not find those continuations of the San Tadeo glacier which are shown on the charts of King and Darwin as extending south to the shore of Kelly fiord. If these existed in the time of the *Beagle* expedition, there must have been a considerable retreat of the ice which one cannot prove in other parts of the San Tadeo glacier. So Dr. Steffen concludes that the sketch is erroneous. But on p. 553 he points out that a glacier in the Benito estuary is *in rapid retreat* and remarks that this is a repetition of the view of the foreland of the San Tadeo glacier! On the whole, then, it is quite likely that Darwin is correct.

The author has much that is interesting to say of the various proposed routes across the Andes. He condemns the road by the Perez Rosales pass and lakes Todos Los Santos and Llanquihue on account of the frequent changes from land to water transport. This is unfortunate, as we had supposed this to be the most promising route for a transcontinental railway; but perhaps train-ferries might solve the difficulty. Many valuable notes will be found regarding harbours, prospects of fishing, settlement, and other economic questions of the future.

Many of the plates are extremely beautiful, and the printing and general get-up of the book are excellent. G. F. S. E.

AUSTRALASIA AND PACIFIC ISLANDS

The Northern D'Entrecasteaux.— **D. Jenness, M.A. (Oxon.)** and the late **Rev. A. Ballantyne,** with a Preface by **R. R. Marett.** Oxford: Clarendon Press. 1920. 12*s.* 6*d. net.*

The D'Entrecasteaux Archipelago which flanks the south-eastern extremity of New Guinea is to all intents and purposes a *terra incognita*, and we are therefore thankful to the Oxford Committee for Anthropology for enabling Mr. Jenness to visit that region and collaborate with his brother-in-law, the late Rev. A. Ballantyne, who had already resided on Goodenough for nine years. The result of their joint studies is a small monograph devoted almost exclusively to Goodenough Island. The intimate acquaintance of one of the authors with the people is an additional guarantee for the reliability of the information imparted. The book gives, in an interesting, clear, and concise manner, an admirable picture of savagery that has scarcely yet been thoroughly tamed, the investigations having been made at that ideal stage when past practices are still alive in memory. The geographical aspects are kept well in view, and the excellent chapters on "The Economic Environment" and "The Social Milieu" will be of especial value to anthropogeographers. The social organization and social customs, the life-history of the individual, the ritual of

the garden, and the accounts of the magic and religious ideas of these pleasing cannibals are succinctly described, and fill up a gap in our knowledge of Papuan ethnography, for it is very strange how little has been written about that archipelago. It may be added that much more remains to be investigated; the great Fergusson and Normanby islands still await scientific exploration. The ethnological specialist would be grateful for more detail on many subjects, and he cannot but feel that a good opportunity has been missed for clearing up certain matters of local and wider interest. Greater pains should have been taken to identify various plants and animals, for general terms or native names do not give the requisite precision; for example, a "squirrel" is mentioned several times, but there are no squirrels in Australasia. The index is somewhat inadequate, but the illustrations are numerous and excellent.

A. C. H.

De Reizen van Abel Janszoon Tasman en Franchoys Jacobszoon Visscher ter nadere Ontdekking van het Zuidland in 1642–3 en 1644. Uitgegeven door **R. Posthumus Meyjes.** (Werken uitgeg. door de Linschoten-Vereeniging, XVII.) *Met* 10 *Kaarten en* 68 *Schetskaarten Landverkenning en Platen.* 's-Gravenhage: Martinus Nijhoff. 1919.

Swart's inaccurate reproduction of Tasman's Extract-Journal is now only to be obtained second-hand, and Mr. Heeres' great work (reviewed in the *Geogr. Journ.*, vol. 13, p. 227) is of inconvenient form and owing to its high price is seldom found except in large libraries. Therefore the Linschoten-Vereeniging has issued the more important documents bearing on these voyages, which will thus be within reach of every one.

The editor, Mr. Meyjes, in a long introduction, relates what little is known of the private lives of Tasman and his colleage F. J. Visscher, and gives brief summaries of the services they rendered to the Dutch East India Company. He also refers to older voyages to Australia, showing that before Tasman's voyages the northern coast had been roughly reconnoitred from the Gulf of Carpentaria to the north-west point of Melville Island, about 11° S. lat., and the west and south coasts from lat. 21° S. to Peter Nuyts land. The credit of the first discovery of Australia he yields to the Portuguese, following Major's original belief in the story told by Manoel Godinho de Eredia of discovery of part of the continent (under the name Nuça Antara) in 1601, five years before the *Duyfken* entered the Gulf of Carpentaria. It is somewhat surprising that Mr. Meyjes, usually so well informed, should be unaware that Major, who put forward the idea of a discovery by Eredia in a paper printed in *Archæologia* in 1861 (also issued as a supplement to his 'Early Voyages to Terra Australis'), subsequently not only transferred the credit of first discovery to the French, on the supposed evidence of the maps of the Desceliers school, but completely retracted his belief in Eredia, whose story he showed pretty conclusively to be an entire fabrication (see papers in *Archæologia*, vol. 44, 1873, Part 2). Apart from this retractation any claim to a discovery in the Southland of the land of "Beach," now well known to be merely a printer's error for the Locach of Marco Polo (Siam or Cambodia), is on the face of it open to grave suspicion.

Mr. Meyjes frequently refers to Mr. Heeres' work, but he does not always agree with that writer's opinions; notably with regard to the relative values of the Extract-Journal in the Rijks-Archief and the Huydecoper MS., which Mr. Heeres styles "a slovenly transcript." Mr. Meyjes replies that the copyist of the R. A. Journal should rather be charged with slovenliness, since he sometimes omits whole sentences and thereby alters the meaning in some cases.

Nor does he admit that the maps in the Huydecoper MS. were "pasted into it at some subsequent period." The most important, that of New Zealand, bears a superscription stating that it was drawn by Franchoijs Jacobszoon (Visscher). In most essential details it is identical with that in the Extract-Journal, and Mr. Meyjes believes that the latter is a copy. The map of the Tonga and Fiji islands is also ascribed to Visscher, and it is stated that the names were inserted according to the directions of Tasman. The authenticity of the Extract-Journal is, however, guaranteed by Tasman's signature.

The directors of the Dutch East India Company expressed dissatisfaction with the results of both the voyages of 1642–3 and 1644. Mr. Meyjes concludes that Tasman was a good seaman but a somewhat inefficient explorer. In the "Zee Haens bocht" the current ran so strongly from the south-east that Visscher inserted a strait (Cook's Strait) on his map, and he holds that more persistence on the part of Tasman would have verified its existence. On the second voyage he seems to have made no serious attempt to sail in the direction of Torres Strait, though particularly instructed to ascertain whether New Guinea was attached to the South Land, and he made a very superficial investigation of the north coast, possibly, as has been suggested, through keeping too far off shore. This verdict is perhaps open to question.

In an appendix Mr. Meyjes discusses the latitudes and longitudes, observed no doubt by Visscher. The former he finds wonderfully accurate, while the latter are not "quite hopeless," as they have been styled. Before sextants and chronometers came into use longitudes could not be ascertained with accuracy.

The maps in the Extract-Journal are reproduced in this volume, many on a reduced scale, and to these are added copies on a small scale of part of the map on the floor of the council chamber of the Ministry of War at Amsterdam, and of part of Bleau's globe (*c.* 1648). The former has already been discussed in the *Geogr. Journal*, vol. 56, p. 232. W. A. T.

Captain Bligh's Second Voyage to the South Sea.— Ida Lee (Mrs. Charles Bruce Marriott). London: Longmans, Green & Co. 1920. Pp. 290. *Charts and Illustrations.* 2 *Diagrams.* 10*s.* 6*d. net.*

A much wanted book, for which geographers and naval historians have long been on the look-out. The task of producing it was at last undertaken by Mrs. Marriott, who is no novice at work of this kind, and has acquitted herself excellently well. It is remarkable that Bligh never published any account of this voyage, in which he commanded H.M.S. *Providence*, with the armed tender *Assistant*, and completely redeemed the failure of his previous expedition in the famous *Bounty*. In the present volume all the essential facts of the voyage to Tahiti and the collection there of bread-fruit plants, the continuation to the Fiji Islands and systematic exploration (as far as time permitted) of that group, and the passage westwards through Torres Strait, are clearly related. Copious extracts from Bligh's journal, which is preserved at the Admiralty, and from those kept by some of his officers (now in the Record Office), supplement the narrative, and reveal Bligh's deep interest in his work and the intense care with which he executed it. These journals are full of circumstance and relevant remarks. They make clear once for all that Bligh, ably seconded by Portlock in the *Assistant*, was the real discoverer of the bulk of the Fiji archipelago, outlying parts of which Tasman in 1643, and Cook in 1773, and Bligh himself, when in the *Bounty's* longboat, had seen but did not examine. And they supply interesting details of the first known meetings between Fijian natives and white men.

Mrs. Marriott also exhibits Bligh as the discoverer of the intricate northern channel through Torres Strait. As she observes in the Introduction to this volume, "Bligh had extraordinary opportunities of proving his skill in navigation; in both voyages he was singularly fortunate, and in both voyages he made fresh discoveries where Tasman and Torres had preceded him." These discoveries were of eminent utility to subsequent navigators, and to the world's commerce in later years; so that, to quote the authoress again, "it is not too much to say that his countrymen are indebted to him for their first knowledge of Fiji and of the islands in Torres Strait."

Whatever Bligh's personal faults may have been (and his martyrdom to malarial headaches or migraine may well account for some of them), one cannot but believe that the chiefs of the Admiralty, after reading these journals, must have felt entire confidence in his skill and prudence as a navigator, his loyalty and devotion to the duties entrusted to him, and his particular qualifications for successfully treating with the Tahitians. He became deeply interested in those islanders' family affairs, their national politics, their social customs, and religious rites; but, unfortunately, though he could chat with them in their own language (having twice been at Tahiti before), he had no conception of its orthography; and, if Mrs. Marriott's book displays a blemish at all, it is due to the outlandish and grotesque spelling of native names and expressions transcribed from Bligh's journal. The book has evidently been prepared with close care and judgment; there are a few unimportant slips of a typographic kind, and here and there a minor error which only readers familiar with life in the islands will detect. Some of these may represent original mistakes in the MS., which was, mostly, not written down by Bligh's own hand but dictated to his clerk, Edward Hatfull. An example is "weasel" for "weevil," at June 7, page 112. It would have been better to state, in note 2 on page 38, that Tahiti was *annexed* to France in 1880, instead of quoting it as a "Protectorate" from 1842. The book is one that should fill a long-standing void, and remain the authority on the transplantation of the bread-fruit tree from Tahiti to the West Indies and St. Helena.

B. G. C.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

Grundlagen der Photogrammetrie aus Luftfahrzeugen.— Profs. Hugershoff and Cranz. Stuttgart: Konrad Wittwer. 1919. *Diagrams and Illustrations. Mk.* 23.40.

Profs. Hugershoff and Cranz dismiss as impractical or too costly photography from airships or balloons, and deal only with photography from an aeroplane. Starting with the necessary skeleton of fixed points, they resect the position of the camera in space at the moment of exposure. The co-ordinates (on the negative) of the trig. points referred to are measured on oblique views taken at an angle of depression of about 30°. Additional ruling points are also fixed from these obliques, but much of the detail survey follows by plotting from photographs taken vertically.

An actual survey was made near Dresden with instruments manufactured by Gustav Heyde, and figures, photographs, and completed map given in the text illustrate it. The cameras used (two) took 13 × 18 cm. plates which were respectively at 165 and 280 mm. from the rear principal point of the lens. Sights, spirit-level, and vertical arc were provided, and a "between the lens" shutter giving a minimum exposure of 1/200 second.

The sensitized side of the plate is pressed against a frame in which four small holes are bored. The corresponding small dots on the negative define its

co-ordinate axes. An explanation of how to determine the position of the optical centre and its distance from the rear principal point of the lens follows. Three fixed points on the photograph are sufficient for this calibration, but more are used generally and a mathematical adjustment made. Sample computations are given, followed by an investigation of the errors of distortion due to the object-glass. Measurements on the negative must not show errors of more than 0·02 mm. To reach this refinement a special comparator fitted with microscopes is used. The next section deals with the "Bildmess Theodolit," used for the measurement of horizontal and vertical angles on the negative. The negative is replaced in the same or a similar camera, registered by the dots, lighted, and observed upon through the object-glass, thereby eliminating errors of lens and of interior adjustment of the camera. The first theodolite of this nature was made in 1896 to a design by Herr Koppe.* The instruments made by Gustav Heyde depart from the original in important points, and have been adversely criticized by Prof. Pulfrich in his "Ueber Photogrammetrie aus Luftfahrzeugen u. die ihr dienenden Instrumente" (Jena, 1919).

The interpolation of the position of exposure in space is described next. The angles subtended at the camera by the lengths of the three sides on the ground are computed from the co-ordinates of the three points as measured on the negative, and from the known distance from the optical centre to the rear principal point of the lens. The ground lengths are computed and complete the data necessary to a solution. The computations (partly graphic and based on a pyramid construction) are given. Some particular examples of interpolation in space from more than three points show probable errors of the order of 1 metre in each of the three directions, whilst new points fixed by intersection show similar errors.

The sequence of work in field and office is well treated, for it bears the stamp of practical experience. The addition of names and the examination on the ground may be done upon a mosaic made from the photographs taken vertically. The authors claim that 1 square mile can be mapped at 1/10,000 at a cost of about £6 (pre-war prices), but much reliance can hardly be placed on these figures. Even if the authors have overstated their case they have presented it in a well-illustrated and arranged form and add a valuable history and bibliography of survey from air-photographs.

H. S. L. WINTERBOTHAM.

GENERAL

The Italian Emigration of Our Times.— Robert F. Foerster. Cambridge, Mass.: Harvard University Press; London, Milford. 1919. 12*s.* 6*d.* net.

Few, even among the warm friends of Italy, can have grasped the extent and importance of Italian emigration during the last twenty years of the old century and the first fourteen of the new. We may have a general idea of the numbers that go to one or two countries, but it is not till we are brought face to face with a full statement of the facts, as in this exhaustive study by Dr. Foerster, that we can see the phenomenon in something approaching its true perspective. In round numbers, some 4,000,000 Italians have permanently settled in other countries, while the temporary emigrants have amounted to about double that figure. When it is remembered that virtually the whole of this emigation goes to foreign countries, Italians have good grounds for claiming that they are entitled to some white man's land to which they may direct

* The same idea had been used earlier by Kapteyn at Gröningen in his "parallactic micrometer" for the measurement of celestial photographs.—ED. *G.J.*

their superfluous population. For, specially in the warmer regions, they maintain their national characteristics and language without being readily absorbed by their neighbours. Thus at Sta. Tereza in Brazil the Poles now speak Italian. Dr. Foerster insists on the loss that civilization would suffer if a race so gifted artistically, whose labour is always welcomed where artistic qualities and neatness and finish are required, were to lose its individuality altogether when it is obliged for economic reasons to go into exile; and he would gladly have seen Tunis, where the Italians, thoroughly race-conscious, do especially well and already far outnumber the French, definitely assigned to Italy. Tunis may in fact, almost be called a Sicilian colony.

Dr. Foerster deals in full detail with the emigration to the principal European countries—France, Germany, and Switzerland, where many Italians have permanently settled, and Austria-Hungary, emigration to which had been rapidly dwindling before the war, since the conditions were becoming no better there than at home. As is well known, all the great Alpine tunnels were built almost entirely with Italian labour, and it is as navvies that Italians have done their best work in the United States. Naturally, the emigration to the United States, which is almost entirely from the backward southern provinces and largely urban in character, is here discussed at considerable length. It is in the Argentine, however, that Italian emigrants have found their greatest opportunity. Indeed, Dr. Foerster considers that the prosperity of the country is due almost entirely to their efforts. They have gone everywhere. They are found in great numbers not only on the land, but in business and as sailors, while they perform the tasks of general labourers, which fall to the lot of Italians throughout the world. Dr. Foerster gives a well-informed account of the conditions at home which have made this emigration a necessity, laying special stress on the lack of education and the general backward condition of the south, which cannot possibly absorb the enormous surplus of births over deaths in its present state, if indeed it ever could. But he thinks that the emigration will help to right the conditions that have caused it, owing to the lessons learnt by the emigrants, and the growing strictness of the emigration laws. He is not afraid to emphasize the seamy side of his subject, and there are plenty of black pages in his book, especially when he writes of Brazil and the United States. Had we space, we should be inclined to quarrel with some details in his estimate of the Italian character. The book is, however, an admirably thorough piece of work, which should be studied by every one who is interested not merely in Italy, but in the whole question of emigration.

L. C. M.

Modern Travel: A Record of Exploration, Travel, Adventure and Sport in all parts of the World during the last forty years, derived from personal accounts by the Travellers.— Norman J. Davidson, B.A. (Oxon.), Author of 'Romance of the Spanish Main,' etc. London: Seeley, Service & Co. 1921. *Price 25s. net.*

On reading the title one wonders how a record of exploration, etc., during the past forty years can be contained in a single moderate-sized volume. The contents are a collection of abstracts from books of travel, and all that the words referred to can mean is that the journeys were made not more than forty years ago. The authors whose works have been put under contribution are very various, and the principle adopted in their selection is not quite obvious; they include missionaries, sportsmen, and naturalists, and the kind of information they furnish depends much on the purposes for which the

journeys were undertaken. In some abstracts it is the country which is more particularly described, in others the natives and their habits, and in others again animals or birds are the chief features. Readers will therefore find variety in these pages, and many may learn all they wish to know of the journeys in this compact form. The illustrations are generally clear and instructive. W. A. T.

Cours de Géographie.— **Prof. I. Halkin.** Namur: A. D. Wesmael-Charlier. Vol. 1, pp. 160, *price* 2.25; vol. 2, pp. 120; vol. 3, pp. 208.

These little books are intended for lower forms, and deal respectively with general geographic ideas and Europe, parts of the world outside Europe, and the geography of Belgium and the elements of general geography and cosmography. They are clear, simple, interesting, well illustrated, and fairly well printed, but on poor paper, and wretchedly bound. Their general accuracy is beyond criticism, but there are one or two dubious or misleading statements, *e.g.* that the Aletsch glacier is the largest in Europe (p. 35); and the comparisons of the English railways—L. & N. W. R. "de Londres à Liverpool" with Midland "de Londres à Glasgow," or L. & S. W. R. "de Londres à Penzance" with G.W.R. "de Londres à Bristol" (p. 68)—are distinctly unfortunate

THE MONTHLY RECORD

EUROPE

Tropical Drift Seeds on the Irish Coasts.

THE subject of the transport of seeds from one part of the world to another by ocean currents has received a good deal of attention of late, especially from Dr. H. B. Guppy, in his book 'Plants, Seeds, and Currents in the West Indies and the Azores' (see review in *Journal*, vol. 51, p. 399). It has long been known that tropical seeds are from time to time picked up on the western coast of Ireland, but until quite lately no systematic attempt had been made to bring together all the records of such finds, and to discuss the origin and mode of transport of the seeds. This has now been done by Mr. N. Colgan in the *Proceedings of the Royal Irish Academy* (vol. 35, Sect. B, No. 3, 1919). Mr. Colgan points out that in the case of tropical seeds carried to Ireland there can be no question of the spread of plants to a new habitat, for although many of the seeds are capable of germinating when found, the plants could not establish themselves in a climate so different from that of their original home. But the subject is none the less of interest from the light which it throws on the currents of the Atlantic and the possibilities of transport of seeds in general. In the first part of the paper the writer brings together all the records he has been able to find of the stranding of tropical seeds on the British shores, his first quotation being over a century earlier than the earliest usually given. It is from the 'Adversaria Nova' (1570) of Mathias de Lobel, who speaks of rare beans found in great plenty on the shores of Cornwall. Other early writers quoted are Sir George Mackenzie (*Phil. Trans.*, 1675), Sir Hans Sloane (*Ibid.*, 1696), Robert Brown (1818), and an anonymous writer in 1823, after which no further record seems to exist until quite modern times. The earliest references are undoubtedly to the bean of *Entada scandens*, the well-known tropical climber whose seeds are sometimes made into match-boxes, and this stands first in the records of Irish drift, both for extension of

range (Kerry, Clare, Galway, Mayo, Donegal, and Antrim) and frequency of occurrence. Altogether eight species can be identified with more or less certainty, five besides the *Entada* being of the Order Leguminosæ (*Mucuna, Guilandina*, etc.). Discussing the origin of the Irish tropical drift, Mr. Colgan fully considers the possibility of human agency, some of the seeds being not infrequently collected by travellers and sailors; but after quoting all that is to be said on this side, he finds the case for the transport by natural means almost unanswerable. Although the old idea of the Gulf Stream as a continuous current from the Gulf of Mexico to our shores must be given up, there is abundant evidence of a means of transport for the whole of that distance through the co-operation of currents, drifts, and winds; the latter stage of the transit, namely from the mid-Atlantic, where the permanent Gulf Stream ceases to act, is probably effected by irregularly recurrent spells of westerly and south-westerly winds, which accord with the irregular intervals at which the seeds have been found. Some of these belong to species from the deltas of the Amazon and Orinoco, whence they have probably been carried first into the Gulf of Mexico.

Types of Farm Buildings in France.

In one of the instructive studies on anthropogeography which we have learnt to expect from Prof. Demangeon, that French geographer discusses, in the *Annales de Géographie* for 15 September 1920, the different types of farmhouses in France, showing their close connection with the varying character of the rural economy. Originally, no doubt, such buildings expressed an intimate relation with the purely physical nature of different parts of the country, according as stone or wood or merely earth was available for their construction. But with the improvement of communications any decided demarcation between different types from this point of view is rapidly being lost. Yet great differences of type still persist in respect of the general arrangement and internal construction of farm buildings. Prof. Demangeon draws a sharp contrast between the state of things in France and that in Great Britain, in which last he states (perhaps somewhat too sweepingly) that only one type of farm prevails, whereas in France he defines at least four, with minor varieties within them. These are: (1) the elementary house, in which all the parts, including the granary and cattle-shed, are under one simple roof, and all on the ground-level; (2) the farm in close order, in which all the individual parts are close together (sometimes enclosing a yard), though the dwelling-house is kept distinct from the cattle-sheds, etc.; (3) the farm in open order, in which the human inhabitants are still further separated from their live-stock; and (4) the raised building, of two or more stories, again under a single roof, but in which the farm people and their goods are shifted to the upper stories, while the live-stock remains on the ground floor. The distribution in space of these four types is governed by differences in the character of the farming (*e.g.* whether mainly agricultural or pastoral) and the scale on which it is carried on in different parts of the country. The first, particularly suitable to the *petite culture* so general in France, is the most widely spread, and for this very reason presents the greatest number of regional varieties. In that seen in Lorraine and neighbouring districts an impression of massiveness and compactness is combined with one of roominess and space—as much as possible, both of crops and live-stock, being brought together under the single roof. The second is found in a compact area in the north of France, its most characteristic form being the Picard or Walloon; but it occurs in scattered areas

elsewhere, as on the fertile plateaux round Paris. It is specially appropriate to farming on a large scale. The third type, which gives more freedom to the farm people and allows greater development of stock-raising, appears above all under the mild littoral climate of Flanders, Picardy, and upper Normandy. The farm of two or more stories, which implies a certain rise in the social scale as evidencing a desire of the farm people to be less intimately associated with their live-stock, is characteristic of a large part of the centre and south of France, including a portion of the Alps. Prof. Demangeon asks whether the affinities noticeable with types in other parts of Europe do not imply that other than local influences have been at work also, such affinities being due to historical relations between the peoples. The paper is well illustrated by reproductions of photographs.

Currents along the Baltic Coasts.

A warm surface current flows along the whole southern and eastern shores of the Baltic, but though the broad fact has long been realized, few detailed and accurate observations of the conditions of flow exist. An attempt to supply this want has been made by Dr. R. Brückmann, whose researches on changes of the Baltic coasts within historic times are well known to geographers. He has attacked the subject both by means of bottle-records (having thrown into the sea a large number of bottles, with the necessary statements enclosed, at various points along the coasts) and by direct observation of the currents, though this last method was beset with many difficulties. The results are published by him in vol. **22**, part i., of the *Forschungen z. Deutschen Landes- und Volkskunde*. Such studies, he points out, are important in connection not only with the physical conformation of the coast, but with the economic relations. The current in question has provided the material both for the *Nehrungen*, which close the lagoons (*Haffe*) of the Prussian coast, and for the moving dunes which cause so much trouble in many parts of the same. In at least one case—that of the fishing-port of Neukuhren—better knowledge of the conditions would have obviated mistakes in the selection of a site for such a purpose. For the German fishery, too, fuller knowledge is very desirable. Of the 116 bottles employed in the investigation 52 were thrown in in autumn, 64 in spring, and the percentages of those recovered were 67·3 and 48·4 respectively. The rate of travel varied greatly, the maximum being 30·4 cm. per second, the average 8·1 cm. Of those recovered, 90 per cent. had moved to the east and north. A careful study of the wind conditions on this coast shows that the yearly percentage of westerly winds is 45·1, so that wind may be safely put down as the chief cause of the current, this being checked for a time when strong easterly winds prevail, but soon resuming its course when their strength moderates. In the latter part of the paper Prof. Brückmann deals with the movements of sand along the coast, showing how this is illustrated by the change in the submarine contours at various points between the dates of successive surveys.

ASIA

Sinai Desert Winds.

The Scirocco winds of the Sinai Desert, which resemble the Egyptian Khamsin, appear to have had some influence upon the conduct of German military operations on the Sinai front, and a discussion of the subject by W. Späth appears in the *Meteorologische Zeitschrift* (1920, Heft 182), on the basis of observations made at a German meteorological station at El Arish during

1916 and 1917. The scirocco in question is a S.E. föhn which, blowing over the Djebel Makrah, Djebel Ililal, and Djebel Magara, descends with great force on to the coastal lands, where it arrives heated by adiabatic compression to the extent of some 4° C. (*circ.* 7° Fahr.). The actual extreme temperature recorded during the prevalence of a wind of this type occurred at Birsheba in May 1916, when the thermometer rose to 43·1° C. (109·6° Fahr.). It is stated that inside tents considerably higher temperatures have been noted—up to 60° C. (140° Fahr.). The scirocco is favoured by low pressure out in the Mediterranean, and occurs chiefly in April and May at the end of the rainy season and again in the autumn before its renewal. Inland the wind often persists day and night, but on the coast it sets in about 7 a.m., attains its greatest force about 11 a.m., and gives place by evening to a sea-breeze. In the early morning before the dusty desert wind sets in the landscape is very clear in the dry air; contours and shadows are sharply defined, while distances seem much foreshortened. It may be noted that the optical quality of "nearness" as an atmospheric effect is by no means synonymous with "visibility," to which aeronautical meteorologists are now giving so much attention.

Middle East Department of the Colonial Office.

The transfer of responsibility for administration and policy in Palestine, Mesopotamia, and Aden from the Departments hitherto dealing with these countries to the Colonial Office took effect on March 1. The Department of the Colonial Office, formed as a result of this transfer, will be under the charge of Mr. J. E. Shuckburgh, C.B., and the services of officers with local experience in the areas in question will be utilized. The Department will deal with questions of policy in other Arab areas within the British sphere of influence, and in this connection the services of Lieut.-Colonel T. E. Lawrence have been secured as Adviser on Arab Affairs.

Origin of the Name Quelpaert.

The origin of the name of Quelpaert Island, near the southern end of Korea, is a problem which has never yet been quite satisfactorily solved. It is generally supposed that the name is of Dutch origin, for one of the first mentions of the island occurs in connection with the unfortunate voyage of the yacht *Sperver*, whose shipwrecked crew landed thereon in 1653, afterwards travelling through the mainland of Korea to Seoul and back. The Linschoten Society has lately published the journal kept by Hendrik Hamel describing the voyage and subsequent travels, from a MS. preserved at the Hague, and the origin of the name Quelpaert is fully discussed by the editor, Mr. B. Hoetink. It is certain that the name was not given on the occasion of the voyage of the *Sperver*, for the island is mentioned as "Quelpaert" in a document of 1648. At that date the word was used by the Dutch in the East to designate a type of vessel also called a galiot, and the Colonial records show that the first of its kind to be used in the Far East was the *Brack*, sent out as an experiment in 1639. This ship is spoken of variously as the "Quel de Brack," "'t Galjot 't Quelpeert," "t' Quelpaert,' "t' Quel," "'t Galiot den Brack," and even as "t' Galiot t' Quelpaert de Brack." Being for a time the only ship of the kind in those waters it was often spoken of by the generic term only, but when others appeared (*e.g.* the *Hasewindt*, the *Visscher*, etc.) the actual name of each came to be added. The probability seems to be that the island was discovered by the *Brack* during a voyage to Japan in 1642, though the records are silent about such a discovery. All this still leaves obscure the derivation

of the word *Quelpaert*. The editor of Hamel's journal makes the tentative suggestion that, like "galiot" itself, the word may have been taken over from the Portuguese, and that it may have been formed (on the analogy of "leopard") by combining with the generic term *pardus* a specific designation—*quelly* or *quel*, explained in Bescherelle's French Dictionary of 1851 (s.v. *Quelly*) as the name of a species of leopard found in Guinea. There seems no doubt that the first two letters represent a hard guttural, being found as such in other names used by the Dutch at the time (though generally preceded by *c*) as in "Nangasacqui" (Nagasaki).

Volcano Studies in the East Indian Archipelago.

Dr. W. van Bemmelen, the well-known Director of the Batavia Observatory, has lately reached Europe on furlough, after ten years' continuous service in the East. Besides his more special work in meteorology and magnetism he has made useful contributions to the geography of the Archipelago, chiefly during trips to the great volcanoes of that region. In 1908 he took part in the expedition to Krakatoa, and sounded the marine basin partly enclosed by the islands remaining after the great eruption (see *Journal*, vol. 37, p. 315). He also made the ascent of Mount Rinjani in Lombok, and sounded its Caldera lake, also visiting Mount Korintji in Sumatra. In company with Dr. Boerema he made soundings and temperature measurements in the remarkable hot acid lake of Mount Idjen, and sounded the crater-lake of Mount Kloet, descending into the now empty crater a few days after the eruption of 1919. He also witnessed secondary eruptions of Mounts Bromo and Tangkoeban Prahoe in Java, and visited many others of the great volcanoes, securing excellent photographs. Besides articles in Dutch periodical publications, he has given popular accounts of his journeys in a book entitled 'Naar hooge toppen en diepe kraters,' published at Leiden. Some of his more specially scientific work has been done in connection with the meteorological stations established by the Batavia Observatory on the tops and slopes of some of the volcanoes. We understand that he will shortly contribute an illustrated article to the *National Geographic Magazine*.

Prof. Molengraaff's Paper in the February Number: Errata.

In the table on p. 114 the word *submersion* is to be transferred to the previous line (following "no fringing reefs" after a semicolon), and does not refer to the last two lines at all. The reference on p. 113 is to the following publication: B. G. ESCHER, "Atollen in den Ned. O. I. Archipel.," *Med. Encyclop. Bureau*, XII., Batavia, 1920.

Srimangal Earthquake of 8 July 1918.

In the latest issue of the *Memoirs of the Geological Survey of India*, vol. 46 (1920), pp. 1–70, Dr. Murray Stuart gives an interesting account of a destructive earthquake in Assam on 8 July 1918. The epicentre lies about 3½ miles south of Srimangal station, and (using Dutton's method) Dr. Stuart estimates the depth of the focus at between 8 and 9 miles. One of the most valuable results is that obtained by the re-levelling of the epicentral district along the line from Silchar to Comilla. First carried out in 1911–12, and repeated in 1919–20, a comparison of the two series shows that to the north-east of the epicentre there has been no appreciable change of level, but that on the other side, from 6 to 30 miles from Srimangal, the ground has subsided from 1½ to 9 inches, suggesting that the earthquake was caused by a downward slip on the southern side of a normal fault situated below the longer axis of the epicentral area.

Typhoons of the Far East.

In view of the shipwrecks that have occurred in the China and neighbouring seas, from vessels being caught unawares in cyclones following unusual tracks, Father Lodis Froc, S.J., Director of the Zikawei Observatory, Shanghai, has brought out an atlas (1920) showing the tracks of the 620 "typhoons" which occurred during the twenty-six years 1893–1918. The term is applied to cyclones, usually bred out in the open Pacific near the Tropic, which move towards the coast of Asia. The charts show for the various months of the year the mean distribution of pressure in the vicinity of eastern Asia, together with the individual paths of all the cyclones recorded in the same months, an arrangement much more useful to sailors than a representation of mean paths only. It is seen that while the great majority of storms travel in a north-westerly direction towards the coast of Asia, a few take a south-westerly course. On reaching the continent many penetrate inland during the hot months, but during the cold season, when pressure is high over the continent, the storms recurve in a north-easterly direction out to sea again. The typhoon season comprises the four months July to October, the monthly averages being respectively 3·4, 3·5, 4·2, 3·7. The height of the season is thus September, the annual number of 4·2 representing a total in the twenty-six years of 110. Why September should be the "black" month is by no means obvious, but the reason may be perhaps connected with minor peculiarities in the pressure distribution of that month not apparent on the general charts. It is interesting to note that, in general, tropical cyclones, to which category of storms "typhoons" belong, develop on the edge of the belt of equatorial calms on the western flank of the oceanic "highs" over expanses of open ocean to the east of great land-masses. The normal course of these revolving hurricanes, north-westerly recurving north-easterly in the northern Tropic, and, correspondingly, south-westerly recurving south-easterly in the southern, is a clear indication that the direction of travel is governed by the steady upper current of the return or Anti-Trade.

AFRICA

The Future of Rhodesia.

The Colonial Office has announced the appointment of a committee, with Earl Buxton as chairman, to advise the Secretary of State on questions affecting the future of Rhodesia. These refer to the possible granting of responsible government to Southern Rhodesia, the working out of a Constitution, and the carrying on of the Administration for the time being by the British South Africa Company; the future of Northern Rhodesia will also be considered.

The Oasis of Siwa.

Mr. F. A. Edwards calls attention to one or two slips made by Mr. W. Seymour Walker in his summary of modern explorations in the oasis of Siwa, published in the January 1921 number of the *Journal* (pp. 29–34). The first modern traveller to the oasis should have been given as William George Browne, not John Browne (pp. 29, 31, and 32), and his visit was in 1792, not 1797. Minutoli again (his full name was Heinrich Freiherr von Minutoli) was there in 1820, not 1827 (p. 31), and Steindorff (p. 32) in 1899, not 1896. Mr. Jennings-Bramly's name has no *e* in the second part. Besides the travellers mentioned by Mr. Walker, various others have visited and described the oasis, and Mr. Edwards sends a list of the most important, with bibliographical references, which will be placed in the Library for the use of those interested in the subject.

Early Portuguese Knowledge of Lake Nyasa.

It is well known that some knowledge of Lake Nyasa was gained by the Portuguese long before its re-discovery by Livingstone: the lake in fact had regularly taken its place, under the name Maravi, as the long narrow sheet of water stretching north-west indefinitely into the interior shown in the maps of the eighteenth century, particularly D'Anville's. But the circumstances under which information about the lake was obtained, in the first quarter of the seventeenth century, are far from generally known, and the clear statement thereon by George Schurhammer, S.J., in *Stimmen der Zeit*, 1920, Heft 4, is therefore of interest. At the time in question the Portuguese had been debarred from the Red Sea coasts by the Turks, and access to the Jesuit missions in Abyssinia was therefore a matter of difficulty, so that the authorities of the Order cast about for some other possible route thither from the coast. Early in the seventeenth century a quondam Negro slave had attained to power in the region of the lower Zambezi, taking the grandiloquent title of *Homesura*, or "All-Compeller." Certain Portuguese who had aided him in his conquests brought back news of a great lake stretching north from Maravi, the headquarters of the chief, and it was felt that this might offer a means of penetration towards Abyssinia. The matter was taken up by Father Palmeiro, "Visitor" of the Jesuit missions in India (Goa), to which those in East Africa were then subordinate, and he sent directions to Father Luis Mariana to inquire into the possibilities of the route. He did so, and in 1624 made an interesting report to the Visitor, who in turn passed on the information to the General of the Order. The report exists in MS. in a volume entitled 'Goana Historia, 1600–1624,' and has been printed by Beccari in vol. 12 of his great collection of documents on the early history of Æthiopia, where however it is to some extent lost in the mass of other matter. Father Schurhammer gives the report in a German translation, and is able to correct one or two mistakes made by Beccari in his version. Most other writers have depended on an abridged Latin version of the report. Mariana described the outlet of the lake by the Shire (Chere) and some of the countries on its shores, as well as the means of navigating it. He considered it to stretch at least as far as the latitude of Mombasa, which may possibly imply that his informants made the not unnatural mistake of considering Nyasa and Tanganyika as one piece of water: it may however be merely due to the common habit of exaggerating distances on the way to the interior—so fruitful a cause of error in the early maps of Africa. Mariana was not deceived as to the difficulties and dangers of an attempt to reach Abyssinia by this route, but although he could find no one willing to undertake such a venture, he expressed his readiness to try himself, if so ordered. The idea was given up, however, the authorities being moreover discouraged by the failure of attempts made at the same time to penetrate inland from Melindi and Zeila.

OCEANIC ISLANDS

Appeal for the Inhabitants of Tristan da Cunha.

The inhabitants of the lonely island of Tristan da Cunha in the South Atlantic occupy a unique position among the subjects of the British Crown. Lying entirely off the frequented ocean routes they are rarely visited by ships, and being unable to produce all the necessities of life they have depended in part even for these on the casual help afforded by generous people in this country. In 1885 the islanders suffered a serious disaster, from which they have never quite recovered, in the loss by drowning of fifteen out of sixteen

male adults through the foundering of a boat while attempting to relieve a ship in distress. Their great need is, however, felt to be that caused by the absence of all means of education and spiritual instruction, for although forming an Anglican community under the diocese of St. Helena, there has been—apart from a period of three years—no resident clergyman since 1889. An appeal has now been made by Mr. Douglas M. Gane for help from private sources to remedy this state of things. Should a sufficient fund be raised it is hoped that the services of a clergyman may be secured, who would work under the Society for the Propagation of the Gospel. Failing this, a lay schoolmaster might be appointed. The islanders, who now number 119, are described as fully deserving of consideration, being truthful and honest, brave and generous, well-mannered and industrious. Their maintenance in the island under suitable conditions is also of serious importance to the Empire, both as preventing annexation by another Power (and the danger which might arise in this case is shown by the use to which the island was put by the United States during the American War of 1812–15), and as a succour to shipwrecked seamen. Donations may be sent to the National Provincial and Union Bank of England, 15, Bishopsgate, E.C. 2, to the credit of the "Tristan da Cunha Fund."

MATHEMATICAL AND PHYSICAL GEOGRAPHY

Ice Observation in the North Atlantic.

In consequence of the *Titanic* disaster steps were taken to organize an International Ice Observation and Patrol Service in the North Atlantic, the management of the service being entrusted to the United States Coastguard. The work was begun in 1913 and continued during the next three years, when the conditions which culminated in the entry of the United States into the war broke it off temporarily, but it was resumed in 1919. By the courtesy of the British Foreign Office we have received a copy of a report issued in 1920 at Washington by the United States Coastguard (Bulletin No. 7) dealing with the work done in 1916 and 1919 and the general conclusions to be drawn from the observations, which have thrown interesting light on the ice-conditions and ocean currents of the region in question. By ice-observation is understood the examination of the conditions in the early part of the year (in February and March) in the neighbourhood, chiefly, of the Newfoundland Bank, while the Ice Patrol signifies the look-out for ice during April, May, and June in the vicinity of the steamer routes across the North Atlantic. This patrol was carried out in both years by two of the Coastguard cutters, working alternately a fortnight at a time. During both stages a regular system of disseminating the data collected by means of wireless telegraphy was maintained. The season of 1916 was remarkable for the little ice of any sort that menaced the Trans-Atlantic steamship routes. Of the bergs seen, the greater number were north of 46° N. In May the Labrador Current was weak while the Gulf Stream was strong and close to the Grand Bank, thus hindering the southward drift of the bergs. In June valuable observations were secured of the disintegration of bergs brought into the influence of the Gulf Stream, the rapidity with which they broke up and melted being very striking. It is thought that the relative strength of the Labrador Current is governed more by barometric pressure than by wind, though the wind conditions resulting from the former would reinforce its direct action. In 1919 again the strength of the Gulf Stream impressed the observers during the earlier part of the season, it being found unusually far to the northward in April, while the Labrador Current seemed to

be dammed back. Early in May, too, the latter current had been forced farther west than usual and few bergs were seen, but in the latter half of the month the current was much stronger and its temperature 6° colder than it had been in April in the same latitude. On May 25 an S.O.S. was received from the British ship *Cassandra*, which had struck an iceberg in 47° 31′ N., 51° 22′ W., but assistance was after all not needed. During June a good number of bergs were seen near Cape Race and in the neighbourhood of the Grand Banks, and their drift and disintegration were observed. During both seasons scientific observations were made by Mr. A. L. Thuras, whose report on the work in 1919 is printed in the Bulletin under notice. It included observations of density, electrical conductivity, and chlorine content.

GENERAL

Forests and Human Progress.

Under this title Mr. Raphael Zon summarizes conveniently, in the *Geographical Review* for September 1920, the various ways in which man has been affected in the past by the great forests of the world, and the importance for the future of the new movement towards re-forestation and rational management. In the earliest times man was largely dominated by forests, which were obstacles to migration and colonization, often playing the part of boundaries separating tribes or nations, or serving as refuges for weak and undeveloped tribes, while the earliest civilizations arose in the more open regions. Special ways in which the forest has acted on man are by regulating his distribution by their provision of fuel-supply, or by moulding his religious beliefs and folk-lore. A new stage is reached when man begins to gain ascendancy over the forest, which he can only do after advancing considerably in civilization. Forests have tended to disappear not only through clearing for agriculture, but through the exploitation of the forest products both as timber and fuel for industries, and their destruction has been aided in the past by the existence of rivers as means of transport; with the introduction of other facilities, the importance of river-transport becomes less. Broadly speaking, the advance of civilization has always meant reduction in the forested areas, the tendency having been only slightly checked by legal protection of woodlands; while on the other hand the decline of an early civilization has permitted the forest to regain some of its lost ground, as is evidenced by the remains of antiquity now completely overgrown by jungle. The struggle with the forest has exercised an important psychological influence, as in the American backwoods, where it has helped to develop strong and self-reliant character, combined no doubt in early days with some amount of coarseness. As is well known, the colonization of forest regions by man has led to a complete change in the composition of the forests left standing: this is well shown in Germany by the spread of coniferous at the expense of broad-leaved forests, the greater prevalence of the latter in early days being indicated by the larger number of place-names derived from their component trees, as compared with those derived from the names of conifers. Many have been the social and economic evils of forest destruction, particularly in mountain regions, where it has induced a torrential character of the streams, with more intense erosion and a liability to floods, and to some extent an actual change of climate. Old forest land has often proved quite unsuited for agriculture and has become a useless waste: in the United States alone there are over eighty million acres of such idle waste land. An appreciation of the value of forests and of the need for rational management is fortunately now general throughout the civilized world,

and though the man-made forests may lack the beauty and grandeur of the wild woods, they are still an important factor in civilization.

Absence of Carbonate of Lime Deposits from deep Ocean Basins.

With reference to the remarks on this subject by Prof. Molengraaff in his paper on the 'East Indian Archipelago' in the *Journal* for February (vol. 57, pp. 98–99), Mr. F. F. Southby has written to suggest as a possible explanation the capacity of water at high pressures to dissolve substances insoluble under ordinary conditions. In the deep basins of the Archipelago, he thinks, under the enormous pressure of 700 atmospheres, $CaCO_3$ may be soluble at 3° C., and at a lesser depth in the warmer waters. He suggests that the matter might be tested by experiment considering the great pressures now obtainable artificially. We referred this suggestion to Prof. Molengraaff, who discusses the question in a letter sent in reply. He says that the possible effect of pressure had suggested itself to him, and that experiments are at present being made at Utrecht by his colleague Prof. Cohen. Even if it should be demonstrated that great pressure should materially increase the solubility of $CaCO_3$ in pure water (*i.e.* free from CO_2, the absence of which is considered to reduce the solubility under ordinary pressure from 1 : 1000 to 1 : 10,000 or less), the difficulty is not entirely removed. Dr. Molengraaff points out that the bottom water in enclosed deep basins is generally supposed to be completely stagnant (in the Black Sea it is even putrid for this reason), so that the layers adjacent to the bottom would soon become saturated, rendering further solution impossible. He puts forward a tentative solution of the difficulty as follows : Below the deep basins the geo-isotherms are closer together than in the surrounding areas, so that the heat of the Earth's interior will flow off more rapidly at the centre than at the margins. This may, he thinks, set in motion a very weak and slow but continuous convection current, the slightly warmer water ascending at the centre of the basins and being replaced by colder water from the sides. This latter will contain oxygen in solution, and will thus be able to oxidize organic matter and generate CO_2, by which fresh amounts of $CaCO_3$ will be continuously dissolved. The suggestion is ingenious, but at present can hardly be regarded as more than an hypothesis. It may be asked, *e.g.*, whether the supposed temperature difference would not be detected by the delicate instruments now in use for oceanographic research.

Permanent Committee on Geographical Names.

With the present number is included the first list of names published by the Permanent Committee : a general list of European place-names, mostly of towns. It is the present intention of the Council to insert such lists loose in the *Journal*, in order that they may be collected for easy reference. Additional copies of the lists will be on sale by the agents for the sale of the *Geographical Journal*.

OBITUARY

Prince Kropotkin.

THE announcement of the death of Prince Peter Alexeivich Kropotkin on 8 February, in a small town near Moscow, where he was virtually interned, will have been received with regret by a wide circle of all classes and all creeds. He had left England, which had been his home for many years, for Russia in

1917, after the revolution had broken out, no doubt with the hope that his "anarchist" aspirations would be realized on a large scale. It need hardly be said that he was grievously disappointed. But this is not the place to deal in detail with Kropotkin's political views, except to express regret that his absorption in these seriously diminished the services which otherwise he might have rendered to Geography.

Prince Kropotkin, descended from one of the oldest princely houses in Russia, was born in the "Old Equerries' Quarter" in Moscow on 8 December 1842, so that when he died he had entered on his seventy-ninth year. In this aristocratic quarter, surrounded by troops of serfs, he spent his first fifteen years. He and his brother Alexander, who were devoted to each other, received a somewhat irregular education from private tutors—French, German, and Russian. The education was mainly literary and historical. So keenly interested in literature was Kropotkin even then (aged thirteen) that he started a review which continued for two years, till he had to leave for St. Petersburg. His father had determined that his sons should enter the Army, and at the age of fifteen Kropotkin, much against his wishes, was admitted to the Cadet Corps, or Corps of Pages, which received only 150 boys, mostly children of the nobility belonging to the Court. Those who passed the final examination could enter any regiment of the Guards or of the Army they chose, while a certain number were attached as pages to members of the Imperial Family. After all, Kropotkin became reconciled to the School, and spent quite an interesting and useful five years going through the various forms. He at first found the lessons so easy that he had plenty of time for private reading. In time, he took up various sciences, Physics, Chemistry, Mathematics, Geography, Cartography, and both in classes and by himself he made considerable progress in this direction.

When in 1863 he had passed his final examinations, in which he took high rank, he had to decide what regiment he wished to enter, it being expected that, like his fellow cadets, he would choose one of the most select—some regiment attached to the Court. But to the consternation of his father and his comrades he decided to join the Mounted Cossacks of the Amur, a new and undistinguished regiment. He had long been interested in Siberia and its geographical problems, especially those connected with the Amur and the Usuri. By selecting a Siberian regiment he would have ample scope for exploration in little-known Eastern Siberia. During his five years in Siberia he had opportunities for carrying out exploring and survey work on the Amur and in Manchuria, the maps of which abounded in blanks and errors. Later still, he explored the Western Sayans, and caught a glimpse of the Siberian Highlands. Finally, he undertook a long journey to discover a direct communication between the gold-mines of the Yakutsk province and Transbaikalia. All this proved of great service to Kropotkin when, after his return to Europe, he took up the difficult problem of the structure of Northern Asia.

In time, Kropotkin and his brother Alexander, who was stationed at Irkutsk, became more and more interested in the revolutionary movements which were developing in Russia and other European countries. They decided to leave the Army and return to St. Petersburg; this they did early in 1867. Kropotkin entered the University, where he worked hard for five years mainly on scientific subjects, devoting special attention to geography. He became intimately associated with the Imperial Geographical Society in his capacity of secretary to its section of physical geography. But his main geographical interest at this time was the vast problem of the Orography of Northern Asia,

the maps of which he considered were "mostly fantastic." This led him in time to extend his investigations into Central Asia. He not only made use of the results of his own travels in Siberia, but with infinite labour collected all the barometrical, geological, and physical observations that had been recorded by other travellers. This preparatory work took him more than two years; followed by months of intense thought to bring order out of what seemed a "bewildering chaos." Suddenly the solution flashed upon him. The structural lines of Asia, he was convinced, did not run north and south or east and west, as Humboldt represented them, but from north-east to south-west. This work he considered his chief contribution to science. A summary of this investigation, which he gave to our Society some years later, was published in the *Geographical Journal*, February and March 1904, as well as another on the Desiccation of Asia, *Geographical Journal*, June 1904.

The next important geographical work undertaken by Kropotkin at the request of the Imperial Geographical Society was a journey through Finland in 1871–72 to study the glaciology of the country. He returned with a mass of most interesting observations. After a visit to Western Europe, Kropotkin returned to St. Petersburg, and in 1874 presented his report on Finland. This he did at a meeting of the Geographical Society, where it was keenly discussed. A day or two later he was arrested, and finally imprisoned in the terrible fortress of St. Peter and St. Paul, but was permitted to finish his work on the Glacial Period in Finland and in Central Europe, which with his *magnum opus* on the Orography of Asia was published after his escape, while he was residing in England under the name of Levashoff. In April 1876 he had been transferred to another prison, and in a few days placed in the military hospital. The romantic story of his escape from this hospital is well known. He had no difficulty in passing through Finland and Sweden to Christiania, where in a British steamer he crossed to England, landing in Hull, and going on to Edinburgh. As he had to work for his living he began to send, in his assumed name, notes, mainly geographical, to *The Times* and *Nature*. He ultimately moved to London, between which and France and Switzerland he migrated, until, after two years' imprisonment in France, he finally settled down in London, where he remained with few intermissions till his unfortunate return to Russia in 1917. He soon formed literary connections in England in addition to *The Times* and *Nature*. He wrote largely for the *Nineteenth Century*, through which he ran his two well-known books, 'Fields, Factories and Workshops,' and 'Mutual Aid among Animals.' To the eleventh edition of the *Britannica* he contributed most of the Russian geographical articles. Of course he soon made himself at home at our Society, and was a valued contributor to the *Journal*. Among his contributions to the *Nineteenth Century* was an article in December 1885, entitled, "What Geography ought to Be," which is well worth reading. It is based on the Report on Geographical Education issued by the Society in that year, and gives a comprehensive view of what he considers the field of geography ought to be, its value from the scientific and practical standpoint, and the place it ought to hold in education. "Surely," he says, "there is scarcely another science which might be rendered as attractive for the child as geography, and as powerful an instrument for the general development of the mind, for familiarizing the scholar with the true method of scientific reasoning, and for awakening the taste for natural science altogether."

Unfortunately, Kropotkin had never again an opportunity of doing active work in the field of scientific exploration. He became more and more absorbed

in the promotion of his socialistic or rather anarchist views, and suffered more and more from the consequences of the hardships he had to endure in prison. In his later years he became almost a chronic invalid, wheeled in a bath chair about Brighton, where he lived for the last few years. His main contributions to geography are the records of his explorations in Eastern Siberia and the discussion of the great problems which they suggested to him, and his investigations into the Glaciology of Finland. He was a keen observer, with a well-trained intellect, familiar with all the sciences bearing on his subject; and although his conclusions may not be universally accepted, there is no doubt that his contributions to geographical science are of the highest value. He made many friends in England. He had a singularly attractive personality, sympathetic nature, a warm but perhaps too tender heart, and a wide knowledge in literature, science, and art. J. S. K.

Arthur John Charles Molyneux, F.G.S.

Mr. A. J. C. Molyneux was one of those cultured frontiersmen whose influence is so valuable in a new country. He inherited a bent for science from his father, a well-known geologist and coal-mining expert, and was himself trained as a mining geologist. One of a numerous family, he was born in the Midlands about fifty-five years ago, and was still young when the family migrated to Natal, where the father died soon afterwards. The son was in the adventurous band who entered Matabeleland in the early '90's, and he participated in the exciting after-search for Eldorado. He remained a staunch Rhodesian for the rest of his life, making Bulawayo his home or headquarters; and by many exploring trips, both north and south of the Zambezi, he acquired a wide knowledge of the shape and structure of the whole region. He had a keen eye for the physiographical aspects and problems of the country, as well as for its stratigraphical features, and his papers communicated to the Geological Society in 1903 and 1909, the first on Southern, the second on Northern, Rhodesia, contain much of geographical import. His memorable paper on "The Physical History of the Victoria Falls," contributed to the *Geographical Journal* (January 1905), was not only a vivid and accurate description of the wonderful spectacle, but also gave for the first time a scientific account of the surroundings and an adequate explanation of the origin of the Falls. Several other papers were published by him in South African scientific journals, mainly in the *Proceedings* of the Rhodesia Scientific Association. Of this society he was one of the founders and mainstays, serving at one time as its president, and continuously in other offices. He was also active in promoting the establishment and aiding in the management of the Rhodesia Museum at Bulawayo. During the last few years of his life he was attached as Geologist to the Geological Survey of Southern Rhodesia, and was the author of some of its recent reports. His services to geology were recognized in the award to him of the Wollaston Fund of the Geological Society in 1909.

Through all the hardships and vicissitudes of a pioneer's life, his placid and kindly disposition remained unimpaired, and gained him friends everywhere. He rejoiced in the rise and growth of the country of his adoption, and was proud to rank as one of its "old-timers."

Failing health induced him to undertake a short visit to the home-land last autumn with the hope of benefiting from the voyage. But the benefit was transient. He died suddenly on December 28th last, almost immediately upon his return to Bulawayo, and his last resting-place is among old comrades there. G. W. L.

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1920–1921

Eighth Evening Meeting, 21 February 1921.—The President in the Chair.

ELECTIONS.—Monsieur Emile Babault; Captain Geoffrey Laidlaw Bartrum; Captain John Bates; Charles Albert Cornell; Captain K. C. J. Davies, I.A.; Captain N. B. Favell; Roby R. Jewell; John Wells Larkin; Miss Mabel Mercer; Sidney Scott; Miss Jennie Georgina Skinner, B.A.; Robert Smith; Frederick Leslie Thomas; Arthur M. Toyer; Charles Cyril Turner; Lieut. J. Ulott, I.A.; John Harold Wellington.

PAPER: The Rio Negro, Casiquiare Canal, and Upper Orinoco. Dr. Hamilton Rice.

Ninth Evening Meeting, 7 March 1921.—The President in the Chair.

ELECTIONS.—Lieut. Louis Ernest Ahrens; Herbert Ash; Frederick John Beechman; James Graham Bower; Walter Russell Brown; Arthur B. Carter; J. Rives Childs; Joseph Chown; Captain Basil Laing Clay; Major Francis Jervoise Collas, O.B.E., M.C., R.A.; Captain Wilfred H. Eva, M.C.; Captain Leonard M. Handley, M.C., I.A.; Mrs. Evelyn Hockley; William Jessop; John C. Johns; George Mitchell Kemp; Ralph Stewart Morrish; Captain G. H. R. St. John Owen; William Rushton Parker, M.A., M.D.; Alfred Peters; James Romanes, M.A.; Marshall King Smith; Arthur H. Tatlow; Major D. B. Thomson; Miss D. R. Williams; F. E. Woodall, M.A.

PAPER: The Organization and Equipment of the Mount Everest Expedition.

Tenth Evening Meeting, 21 March 1921.—The President in the Chair.

ELECTIONS.—Hugh Adams; Alfred Dickinson, M.INST.C.E.; Miles Wedderburn Lampson; Lieut. Alexander Gault Macgowan; Captain Lionel Henry Mander; Captain Edward Hamilton Mann, R.H.A.; Joseph Ogden; John Ashby Offer; John Walter Price; Roderick Urwick Sayce; Mrs. Mildred Leo Clemens-Schenck; Maraduke T. Tudsbery, A.M.INST.C.E.; Edward Valpy; Captain Walter Richard Worthington; Captain John William Young, I.A.

PAPER: Present Day Conditions in Spitsbergen. J. M. Wordie.

Fifth Afternoon Meeting, 14 March 1921.—The President in the Chair.

PAPER: Notes on Map Projections.
Colonel Sir Charles Close.
C. T. McCaw.
A. R. Hinks.

Repp. of Geographical Journal for April '21

PERMANENT COMMITTEE ON GEOGRAPHICAL NAMES FOR BRITISH OFFICIAL USE.

FIRST GENERAL LIST OF EUROPEAN NAMES.

The spelling of the European place-names in the following list is that decided on by the Permanent Committee on Geographical Names for British Official Use. It is recognised that the spelling of names is not consistent, *e.g.* two places in the same country may be given, one in the native and the other in a conventional form. The aim throughout has been to give the former precedence over the latter, but owing to confirmed usage a large number of conventional spellings have had to be retained.

In the new states of Central Europe many place-names have been changed by the change in official language; and in other countries, *e.g.* Sweden and Holland, a new spelling has been officially adopted.

In this list many popular mis-spellings and mis-pronunciations have been corrected, and it is hoped that the list will supply a standard for spelling these names in the future.

Alternative spellings are given for use when the printer has not the necessary varieties of type, as in Rumanian, Polish, etc. Where the diacritical marks are retained without an alternative being given, the alternatives would be represented by the name with the diacritical marks omitted. The Committee strongly recommend that these marks be retained wherever possible.

This list will be followed by further lists of European, Asiatic, African, American and Australasian names, to be published as leaflets with the *Geographical Journal*.

EDWARD GLEICHEN, Maj.-Gen.,
Chairman, P.C.G.N.

ROYAL GEOGRAPHICAL SOCIETY,
Kensington Gore,
London, S.W. 7.

April, 1921.

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FIRST GENERAL LIST OF EUROPEAN NAMES.

ABBREVIATIONS, Etc.

Alb.	Albanian.	Mag.	Magyar (Hungarian).
alt.	alternative.	mod.	modern.
anc.	ancient.	mt.	mountain.
Ar.	Arabic.	Nor.	Norwegian.
Bulg.	Bulgarian.	off.	official.
Českoslov.	Československá Republika = Czechoslovakia (see list).	orig.	original.
		pen.	peninsula.
Česky	Czech.	Pol.	Polish.
conv.	conventional.	pop.	popular.
Dan.	Danish.	Port.	Portuguese.
dept.	department.	pr.	pronounced.
Est.	Estonian.	prop.	properly.
Finn.	Finnish.	riv.	river.
Flem.	Flemish.	Rum.	Rumanian.
form.	formerly.	Russ.	Russian.
Fr.	French.	S.H.S.	(Kraljevina) Srba Hrvata i Slovenaca = Yugoslavia (see list).
Geor.	Georgian.		
Ger.	German.		
Gr.	Greek.	Sp.	Spanish.
isld.	island.	Swed.	Swedish.
Ital.	Italian.	Turk.	Turkish.
Lat.	Latin.	Ukr.	Ukrainian.
Lett.	Lettish.	Wall.	Walloon.
Lith.	Lithuanian.		

a, *e*, *u* = the neutral vowel as in marine, often, difficult.

Åbo: pr. Obo: Finland; conv. (Swed.) for Finn. Turku; (not Åbö).

Adige: pr. A'dïjĕ (not Adtj): riv., Italy; Ger. Etsch.

Aigion: pr. Éyion: Greece; Gr. Αἴγιον; form. Βοστίτσα = Vostitsa; (not Aegion, Vostitza, Vostizza).

Akhtopol: Bulgaria; Bulg. Ахтополъ; Gr. Ἀγαθόπολις = Agathopolis; Turk. اخته بولی = Akhteboli; (not Agatopolis, Agathopoli, Aghatopoli, Akhtabolou, Akhtebolu, Ak Teboli).

Åland: pr. Oland: islds., Finland; conv. (Swed.) for Finn. Ahvenanmaa; (not Aaland).

Alba Iulia: pr. Alba Yulya: Transylvania, Rumania; Ger. Karlsburg; Mag. Gyulafehérvár, pr. Dyula-.

Altona: pr. A'ltŏna: Hamburg, Germany.

Antivari: pr. Antívări: Montenegro, S.H.S.; conv. (Ital.) for Serb-Croat Бар, Bar; Alb. Tivar.

Antwerp: Belgium; conv. for Fr. Anvers; Flem. and Ger. Antwerpen.

Archangel: Russia; conv. for Russ. Архангельскъ = Arkhangel'sk; (not Arkhangel).

Argyrokastron: pr. Aryirókastron: Albania; conv. (Gr. Ἀργυρόκαστρον) for Alb. Gjinokastre, pr. Gyinokástre; Turk. ارگری = Ergeri; (not Argyrokastro, Arghyrocastro).

Athens: Greece; conv. for Gr. Ἀθῆναι = Athēnai, pr. Athīne; Fr. Athènes; Ger. Athen; Ital. Atene; Sp. Atenas; Russ. Аѳины = Afini.

Athos, Mount: conv. for one or all of the following: (1) Ἄθως = Athos, monastery, (2) Ἅγιον Ὄρος = Agion Oros, pr. A'yion Oros, mt., (3) Ἀκτή = Aktē, pr. Aktí, pen.; Ital. Monte Santo; Bulg. Света Гора Атонска = Sveta Gora Atonska.

Augustów: pr. Augústuf: Poland; Russ. Августовъ = Avgustov, pr. Avgustóf; Lith. Augustavas; (not Augustovo).

Badajoz: pr. Vadhahóth (nearly): Spain.

Balaton: lake, Hungary; Ger. Platten See; Serb-Croat Блатно Језеро, Blatno Jezero, pr. Yézero.

Basle: pr. Bāl: Switzerland; conv. for Ger. Basel; Fr. Bâle; Ital. Basilea.

Belgrade: S.H.S.; conv. (and Fr.) for Serb-Croat Београд, Beograd, pr. Beógrad in Serb, Biógrad in Croat; Ger. Belgrad.

Berezina: riv., White Russia; Russ. Березина, pr. Byeryézina; Pol. Berezyna; (not Beresina).

Berne: Switzerland; Fr.; Ger. Bern; Ital. Berna.

Białystok: pr. Byawístok (nearly): Poland; Russ. Бѣлостокъ = Byelostok; Lith. Balstoge; (not Belostok, Bielostock).

Biscay, Bay of: France–Spain; conv. for Fr. Golfe de Gascogne, pr. Gaskon'; Sp. Golfo de Vizcaya, pr. Vithkaya.

Bistrița or **Bistritsa**: Transylvania, Rumania; Mag. Besztercze, pr. Bestertse; Ger. Bistritz.

Björneborg: pr. Byörnebor' (almost -bori): Finland; conv. (Swed.) for Finn. Pori; (not Biörneborg, Berneborg).

Borodino: pr. Bărădīnó: Russia; Russ. Бородино.

Brăila: pr. Braila: Rumania; (not Braïla, Ibrail).

Brasov or **Brashov**: Transylvania, Rumania; Mag. Brassó, pr. Brŏshshō; Ger. Kronstadt.

Bratislava: Československ.; Ger. Pressburg; Mag. Pozsony, pr. Pozhon'; (not Prešpurk).

Brno: pr. Berno: Československ.; Ger. Brünn.

Bromberg: Poland; conv. (Ger.) for Pol. Bydgoszcz, pr. Bídgoshch.

Brunswick: Germany; conv. for Ger. Braunschweig.

Brussels: Belgium; conv. for Fr. Bruxelles, pr. Brüxél in Belgium, Brüsél in France; Flem. Brussel; Ger. Brüssel.

Bucharest: Rumania; conv. for Rum. București, pr. Bukuréshtĭ; Fr. Bucarest; Ger. Bukarest.

Budapest: pr. Budapesht: Hungary; (not Buda-Pest, Budapesth).

Budějovice: pr. Búdyeyovitse: Československ.; Ger. Budweis.

Burgas: Bulgaria; Bulg. Бургасъ; Turk. برغوس = Burghus; (not Bourgas, Burghaz).

Cadiz: pr. Kádhith: Spain; conv. for Sp. Cádiz; Fr. Cadix.

Candia: town, Crete; conv. (Ital. from orig. Ar. خندق = Khandaq); Gr. Ἡράκλειον = Ērakleion, pr. Iráklion; Fr. Candie; (not Herakleon, Heraklion, Megalo Kastron).

Canea: pr. Kanéa: Crete; conv. (Ital.) for Gr. Χανιά = Khania; Fr. La Canée.

Carlsbad: Českoslov.; conv. (Ger.) for Česky Karlovy Vary; Austro-Ger. Karlsbad.

Cartagena: pr. Kartakhéna: Spain; Fr. Carthagène; (not Carthagena).

Cattaro: pr. Káttaro: S.H.S.; conv. (Ital.) for Serb-Croat Котор, Kotor.

Cephalonia: Greece; conv. (Lat.) for Gr. Κεφαλληνία = Kephallēnia, pr. Kefalinía; Ital. Cefalonia; (not Kephalonia).

Cernavoda: pr. Chernavoda: Rumania; Fr. Tcherna Voda.

Cetinje: pr. Tsétinye: Montenegro, S.H.S.; Serb Цетиње; Ital. Cettigne; (not Cettinje).

Châlons-sur-Marne: Marne, France; (not Châlon).

Chalon-sur-Saône: Saône et Loire; France; (not Châlons, Châlon).

Cheb: pr. Khep: Českoslov.; Ger. Eger.

Chernigov: pr. Chernígof: Ukraine; Russ. Черниговъ; Ukr. Чернигів = Chernihiv; Fr. Tchernigov; Ger. Tschernigow.

Christiania: Norway; conv. for Nor. Kristiania.

Christiansand: Norway; conv. for Nor. Kristiansand; (not Christianssand).

Christiansund: Norway; conv. for Kristiansund; (not Christianssund).

Cluj: pr. Kluzh: Transylvania, Rumania; Mag. Kolozsvár, pr. Kolozhvar; Ger. Klausenburg.

Coblenz: pr. Kóblents: Germany; off. Ger.; pop. Ger. Koblenz; Fr. Coblence; (not Coblentz).

Cologne: pr. Kolón': Germany; conv. (Fr.) for off. Ger. Cöln; pop. Ger. Köln.

Constance, Lake of: Switzerland–Germany–Austria; conv. for Ger. Boden See; Fr. Lac de Constance; Ital. Lago di Costanza; (but see Konstanz).

Constanţa or **Constantsa**: Rumania; Turko-Bulg. Кюстенджа = Kyustendja; (not Constantza, Constanza, Kustendji).

Constantinople: Turkey; conv. (and Fr.) for Turk. استانبول = Istanbul, pr. Istambul; anc. Gr. Βυζάντιον = Byzantion; Lat. Byzantium; mod. Gr. Κωνσταντινούπολις = Konstantinoupolis; Russ. and Bulg. Царьградъ = Tsar'grad; Ger. Konstantinopel; (not Stamboul).

Copenhagen: Denmark; conv. for Dan. Kjöbenhavn, pr. Köpenhaun; Fr. Copenhague; Ger. Kopenhagen.

Córdoba: pr. Córdova: Spain; Fr. Cordoue; (not Cordova).

Corfu: Greece; conv. (Ital.) for Gr. Κέρκυρα = Kerkyra; Lat. Corcyra; Serb-Croat Крф, Krf; Fr. Corfou.

Corinth: Greece; conv. for Gr. Κόρινθος = Korinthos; Fr. Corinthe; Ital. Corinto.

Corunna: Spain; conv. for Sp. La Coruña, pr. La Korunya; Fr. La Corogne; old Eng. The Groyne.

Cracow: Poland; conv. for Pol. Kraków, pr. Krákuf; Ger. Krakau; Fr. Cracovie.

Czechoslovakia: pr. Chekho-: conv. but quite incorrect (partly Pol.) for Československá Republika, pr. Chesko-; Fr. Tchéco-Slovaquie; Ger. Tschechoslowakien.

Czernowitz: pr. Chérnovits: Bukovina, Rumania; conv. (Ger.) for Rum. Cernauţi, pr. Chernautsi; Ukr. Чернівці = Chernivtsi; Pol. Czerniowce, pr. Chernyóftse; (not Czernovitz).

Danube: riv.; conv. (and Fr.) for Ger. Donau; Česky and Pol. Dunaj; Mag. Duna; Serb-Croat Дунав, Dunav; Bulg. Дунавъ = Dunav; Rum. Dunărea; Ital. Danubio; Russ. Дунай = Dunai; Gr. Δούναβις = Dounavis.

Danzig: pr. Dantsikh (nearly): Pol. Gdańsk, pr. Gdan'sk; Lith. Giedainys; (not Dantsic, Dantzig).

Děčin: pr. Dyechin: Českoslov.; Ger. Tetschen; (not Tetchen).

Delfzijl: pr. Delfzail: Holland; form. Delfzyl.

Dnieper: riv., Ukraine–White Russia; conv. for Russ. Днѣпръ = Dnyepr; Ukr. Дніпро = Dnipro; Pol. Dniepr.

Dniester: riv., Ukraine–Rumania; conv. for Russ. Днѣстръ = Dnyestr; Ukr. Дністер = Dnister; Rum. and Pol. Dniestr.

Dobruja: pr. Dóbruja: Rumania; conv. for Rum. Dobrogea, pr. Dóbrojĕa; Bulg. Добруджа = Dobrudja; Ger. Dobrudscha.

Dorpat: Estonia; conv. (Ger.) for Est. Tartu; Russ. Юрьевъ = Yur'ev, pr. Yúryef; Swed. Dorpt.

Drava: riv.; Ital. and Croat; Serb Драва; Mag. Dráva; Fr. Drave; Ger. Drau.

Dulcigno: pr. Dulchĭnyo: Montenegro, S.H.S.; conv. (Ital.) for Serb-Croat Улцињ, Ulcinj, pr. Úl'tsin'.

Dunkirk: France; conv. for Fr. Dunkerque; (not Dunkerke).

Durazzo: pr. Duratso: Albania; conv. (Ital.) for Alb. Durres; Serb-Croat Драч, Drač, pr. Drach; Gr. Δυρράχιον = Dyrrakhion.

Dvinsk: Latvia; conv. (Russ. Двинскъ) for Lett. Daugavpils; Lith. Daugpilis; Ger. Dünaburg; (not Dwinsk, Dünaberg).

Djakovica or **Dyakovitsa**: pr. Dyákovitsa: Montenegro, S.H.S.; Serb Ђаковица; (not Djakova).

Elbrus: pr. Ēl'brus: mt., Caucasus; Russ. Эльбрусъ; Geor. ელბუზი = Ialbuzi; Tatar Mingi Tau; (not Elbruz, Elburz).

Epirus: pr. I'pirus: Greece; conv. (Lat.) for Gr. Ἤπειρος = Ēpeiros, pr. I'piros; Fr. Épire; Ital. Epiro.

Euboea: Greece; conv. (Lat.) for Gr. Εὔβοια = Evvoia, pr. Évvia; alt. Εὔριπος = Evripos (properly the straits between Euboea and mainland); Fr. Eubée; Ital. Negroponte.

Faeroes, The: islds., Denmark: conv. for Dan. Faeröerne: Faer. Föroyar: (not Faroe).

Finistère: dept. France; (not Finisterre).

Finisterre: pr. Finistĕrĕ: cape, Spain; (not Finistère).

Florence: Italy; conv. (and Fr.) for Ital. Firenze, pr. Firentse or Firendze; Ger. Florenz.

Florina: strictly Phlorina: pr. Florína: Greece; Gr. Φλωρίνα; Turk. فيلورينه = Filorina; Serb-Croat Лерин, Lerin.

Flushing: Holland; conv. for Dutch Vlissingen; Fr. Flessingue.

Focşani or **Focshani**: pr. Fokshani: Rumania; (not Fokchany).

Frankfurt (on the Main): Germany; Ger. Frankfurt am Main; Fr. Francfort; (not Frankfort).

Frankfurt (on the Oder): Germany; Ger. Frankfurt am Oder.

Fredrikstad: Norway; (not Fredriksstad, Frederikstad).

Friedrichstadt: pr. Fridrikhshtatt: Latvia; conv. (Ger.) for Lett. Jaunjelgava, pr. Yaúnyelgava; Lith. Naujarigis; (not Fridrichstadt, Fridrikhshtadt).

Galatz: Rumania; conv. (and Fr.) for Rum. Galaţi, pr. Galatsi; Ger. Galaz.

Gallipoli: Dardanelles; conv. (Ital.) for Greek Καλλίπολις = Kallipolis: Turk. گليولى = Geliboli; not to be used for the peninsula without the word Peninsula.

Gatchina: pr. Gát-chĭna: Petrograd, Russia; Russ. Гатчина; Ger. Gattschina; (not Gachina).

Gävle: pr. Yävle: Sweden; form. Gefle or Gäfle.

Geneva: Switzerland; conv. for Fr. Genève; Ger. Genf; Ital. Ginevra.

Genoa: Italy; conv. for Ital. Genova, pr. Jénova; Fr. Gênes; Ger. Genua.

Ghent: Belgium; conv. for Fr. Gand; Flem. and Ger. Gent.

Göteborg: pr. Yötebor' (nearly): Sweden; (not Gothenburg).

Gottland: Sweden; form. Gotland; (not Gothland).

Gravosa: S.H.S.; conv. (Ital.) for Serb-Croat Груж, Gruž, pr. Gruzh.

Graz: pr. Grats: Austria; (not Gratz, Gräz).

Hague, The: Holland; conv. for Dutch 's Gravenhage; Fr. La Haye; Ger. Haag; Ital. L'Aia; Sp. La Haya.

Hälsingborg: pr. Hälsingbor': Sweden; form. Helsingborg.

Hangö: pr. Hang-ö: Finland; conv. (Swed.) for Finn. Hanko; (not Hango).

Hanover: Germany; conv. for Ger. Hannover; Fr. Hanovre.

Havre: France; conv. for Fr. Le Havre; (not Hâvre).

Helsingfors: Finland; conv. (Swed.) for Finn. Helsinki; Est. Helsingi.

Helsingör: pr. Helsing-ör: Denmark; (not Elsinore).

Hook of Holland: conv. for Dutch Hoek van Holland, pr. Huk van Hollant.

Iceland: conv. for Icel. Ísland; Dan. and Ger. Island; Fr. Islande.

Innsbruck: Austria; (not Innsbrück).

Jakobstad: pr. Yakobstad: Finland; conv. (Swed.) for Finn. Pietarsaari: (not Jacobstadt).

Jakobstadt: pr. Yakobshtatt: Latvia; conv. (Ger.) for Lett. Jēkabmiests, pr. Yékabmiästs; Lith. Jokubmietis; (not Jacobstadt, Jakobstad).

Jarosław: pr. Yaróswaf (nearly): Poland; Ger. Jaroslau; Ukr. Ярослав = Yaroslav.

Jassy: pr. Yashi: Rumania; conv. for Rum. Iaşi; (not Jassi).

Jerez: pr. Kheréth: Cadiz, Spain; prop. Jerez de la Frontera; form. Xeres.

Jihlava: pr. Yíhlava: Českoslov.; Ger. Iglau.

Jitomir: pr. Zhitómir: Ukraine; Ukr. and Russ. Житомір(ъ); Pol. Żytomierz; Ger. Shitomir; (not Zhitomir).

Joachimsthal: Českoslov.; conv. (Ger.) for Česky Jáchymov, pr. Yäkhimof.

Kattegat: Denmark–Sweden; Dan.; Swed. Kattegatt; (not Cattegat).

Kharkov: pr. Khár'kof: Ukraine; Russ. Харьковъ; Ukr. Харків = Kharkiv; Germ. Charkow; (not Charkoff).

Kiev: pr. Kíyef: Ukraine; Russ. Кіевъ; Ukr. Київ = Kiyiv; Ger. Kijew; (not Kieff).

Kishinev: pr. Kishinyóf: Bessarabia, Rumania; conv. (Russ. Кишиневъ) for Rum. Chişinău, pr. Kishin*a*; Ukr. Кишинів = Kishiniv.

Konstanz: pr. Konstants: town, Germany; (not Constance).

Koritsa: Albania; conv. for Alb. Korçe, pr. Korche; Serb-Croat Горица, Gorica, pr. Góritsa; Gr. Κορυτσά = Korytsa; (not Koritza).

Košice: pr. Kóshitse: Českoslov.; Ger. Kaschau; Mag. Kassa, pr. Koshsho; Pol. Koszyce, pr. Koshítse.

Kovno: Lithuania; conv. for Lith. Kaunas; Pol. Kowno; Russ. Ковна = Kovna.

Ladoga: pr. Ládoga: lake, Russia–Finland; Russ. Ладога, prop. Ладожское озеро = Ladojskoe ozero, pr. Ládozhskoye ózyero; Finn. Laatokka.

Leghorn: Italy; conv. for Ital. Livorno; Fr. Livourne.

Leipzig: pr. Laiptsikh: Germany; Česky Lipsko; (not Leipsic).

Lemberg: Poland; conv. (Ger.) for Pol. Lwów, pr. Lvuf; Ukr. Львів = L'viv; Russ. Львовъ = L'vov; Fr. Léopol.

Levkas: pr. Lefkás: Greece; Gr. Λευκάς; Lat. Leucas; anc. Gr. also Λευκαδία = Levkadia; Lat. Leucadia; Ital. Santa Maura.

Libau: Latvia; conv. (Ger.) for Lett. Liepaja, pr. Liäpaya; Lith. Liepoja; Russ. Либава = Libava.

Liberec: pr. Liberets: Českoslov.; Ger. Reichenberg.

Liége: pr. Liĕzh: Belgium; Fr. (off.); Wall. Lige; Flem. Luik; Ger. Lüttich; (not Liège).

Lions, Gulf of: France; conv. for Fr. Golfe du Lion; Sp. Golfo de Leon; Ital. Golfo del Lione; (not Lyons).

Lisbon: Portugal; conv. for Port. Lisboa, pr. Lizhbóa; Fr. Lisbonne Ger. Lissabon; Ital. Lisbona.

Ljubljana: pr. Lyúblyana: S.H.S.; Serb Љубљана; Ger. Laibach; Ital. Lubiana.

Łódź: pr. Wūd'sh (nearly): Poland; Russ. Лодзь = Lodz'.

Luxembourg: Fr. (off.); Ger. Luxemburg.

Lyons: France; conv. for Fr. Lyon; Ital. Lione.

Mainz: pr. Maints: Germany; Fr. Mayence.

Majorca: Spain; conv. (Ital.) for Sp. Mallorca, pr. Malyórka; Fr. Majorque.

Mantua: Italy; conv. for Ital. Mantova, pr. Mántova; Fr. Mantoue.

Marienbad: Českoslov.; conv. (Ger.) for Česky Marianské Lázné.

Marseille: pr. Marseiy: France; Ital. Marsiglia; Sp. Marsella; (not Marseilles).

Metković or **Metkovich**: S.H.S.; Serb. Метковић; (not Metkovitch, Metkovic).

Milan: Italy; conv. (and Fr.) for Ital. Milano; Ger. Mailand.

Minorca: Spain; conv. (Ital.) for Sp. Menorca; Fr. Minorque.

Mitau: Latvia; conv. (Ger.) for Lett. Jelgava, pr. Yélgava; Lith. Jelguva; Russ. Митава = Mitava.

Modena: pr. Módena: Italy; Fr. Modène.

Monastir: S.H.S.; conv. (Turk. مناستر) for Serb-Croat Битољ, Bitolj, pr. Bítol'; Bulg. Битоля = Bitolya; Gr. Μοναστήριον = Monastērion.

Moscow: Russia; conv. for Russ. Москва = Moskva, pr. Maskvá; Fr. Moscou; Ger. Moskau; Ital. Mosca.

Most: Českoslov.; Ger. Brüx.

Mulhouse: pr. Mülūz: Alsace, France; Ger. Mülhausen.

Munich: Germany; conv. (and Fr.) for Ger. München; Ital. Monaco.

Murman: coast, N. Russia; Russ. Мурманъ, prop. Мурманскій берегъ = Murmanski bereg, pr. byéryek; (not Murmansk).

Murmansk: town, N. Russia; Russ. Мурманскъ; (not Murman, Romanov na Murmanye).

Naples: Italy; conv. (and Fr.) for Ital. Napoli; Ger. Neapel.

Neufahrwasser: Danzig; Pol. Nowy port, pr. Novi.

Niemen: pr. Nyémen: riv., Russia, etc.; Pol.; Russ. Нѣманъ = Nyeman; Lith. Nemunas; Ger. Memel and Russ in lower reaches.

Nijni Novgorod: pr. Nízhni Nóvgorod: Russia; Russ. Нижній Новгородъ: Ger. Nishni . . .; (not Nizhni . . .).

Nikolaistad: Finland; conv. (Swed.) for Finn. Nikolainkaupunki; (not Vasa, the old town 5 km. S.E.).

Nish: S.H.S.; Serb-Croat Ниш, Niš; Fr. Niche; Ger. Nisch.

Nürnberg: Germany; (not Nuremberg).

Nykjöbing: pr. Nüköping: Denmark.

Nyköping: pr. Nüchöping: Sweden.

Odorhei: Transylvania, Rumania; Mag. Székelyudvarhely, pr. Sēkel'-údvarhel'.

Okhrida: pr. Ókhrĭda: lake, S.H.S.–Albania; conv. for Serb-Croat Охрид, Ohrid, pr. Ókhrid, prop. Охридско језеро, Ohridsko jezero; Alb. Liqeni i Ohrit, pr. Likyéni i Ohrít; (not Ochrida).

Olomouc: pr. Ólomōts: Českoslov.; Ger. Olmütz.

Oltu: riv., Rumania; Mag. Olt; Ger. Alt; (not Aluta).

Onega: pr. Anyéga: lake, Russia; Russ. Онега, prop. Онежское озеро = Onejskoe ozero, pr. Anyézhskoye ózyero.

Oost-Dunkerke: Belgium; (not Dunkerque, Dunkirk).

Opava: pr. Ópava: Českoslov.; Ger. Troppau.

Oporto: Portugal; conv. for Port. Porto.

Oradia Mare: Transylvania, Rumania; Ger. Grosswardein; Mag. Nagyvárad, pr. Nod'varod.

Orsova: pr. O'rshŏvă: Rumania; conv. (Mag.) for Rum. Orşova; Serb-Croat Оршава, Oršava, pr. O'rshava.

Ostend: Belgium; conv. for Fr. and Flem. Ostende.

Padua: Italy; conv. for Ital. Padova; Fr. Padoue.

Patras: pr. Patrás: Greece; conv. for Gr. Πάτραι = Patrai, pr. Pátre, or Πάτρα = Patra; Lat. Patrae; Ital. Patrasso.

Peć or **Pech**: pr. Pet': Montenegro, S.H.S.; Serb Пећ; Turk. ايپك = Ipek.

Pécs: pr. Pēch: Hungary; Ger. Fünfkirchen; Serb-Croat Печуј, Pečuj, pr. Pechui.

Pernau: Estonia; conv. (Ger.) for Est. Pärnu; Russ. Перновъ = Pernov.

Petrograd: pr. Pyetrográd: Russia.; Russ. Петроградъ; form. Санктъ Петербургъ = Sankt Peterburg, conv. St. Petersburg; pop. Russ. Peterburg or Pitr; Finn. Pietari.

Philippopolis: Bulgaria; conv. for Bulg. Пловдивъ = Plovdiv; Turk. فلبه = Filiba; Fr. Philippopoli; Ger. Philippopel.

Pietroşani or **Pietroshani**: Transylvania, Rumania; Mag. Petrozsény, pr. Pétrozhēn'.

Pilsen: Českoslov.; conv. (Ger.) for Česky Plzeň, pr. Pulzen'.

Piraeus: Greece; conv. (Lat.) for Gr. Πειραιεύς = Peiraievs, pr. Pireéfs; Fr. Le Pirée; Ital. Pireo.

Port Baltic: Estonia; conv. for Est. Baltiski; Russ. Балтійскій портъ = Baltiski port; Ger. Baltischport; Fr. Port Baltique.

Posen: town, Poland; conv. (Ger.) for Pol. Poznań, pr. Póznan'.

Posnania: district of Posen (*q.v.*), Poland; conv.

Prague: Českoslov.; conv. (and Fr.) for Česky Praha; Ger. Prag; Ital. Praga.

Przemyśl: pr. Pzhémishl: Poland: Russ. Перемышль, Ukr. Перемишль = Peremishl'.

Pulkovo: pr. Púlkŏvŏ; Petrograd, Russia; Russ. Пулково; Fr. Poulkovo; Ger. Pulkowa; (not Pulkova).

Rădăuţi or **Radautsi**: Bukovina, Rumania; Ger. Radautz; Pol. Radowce, pr. Radoftse.

Ragusa: S.H.S.; conv. (Ital.) for Serb-Croat Дубровник, Dubrovnik.

Rauma: Finland; Swed. Raumo.

Retimo: pr. Rétimo: Crete; conv. (Ital.) for Gr. Ῥέθεμνος = Rethemnos, or Ῥέθυμνον = Rethymnon; anc. Gr. Ῥεθύμνη = Rhethymnē, pr. Rethímni; (not Rhethymni, Rhethymnon, Rhithymno, Rethimno, Rethimnon, Retymo).

Revel: pr. Rével': Estonia; conv. (Russ. Ревель) for Est. Tallinn; Ger. Reval.

Rhine: riv.; conv. for Ger. Rhein; Fr. Rhin; Dutch Rijn; Ital. Reno.

Rome: Italy; conv. (ahd Fr.) for Ital. Roma; Ger. Rom; Russ. Римъ = Rim.

Ruschuk: pr. Rus-chuk: Bulgaria; conv. (Turk. رسچق = Ruschuq) for Bulg. Русе = Russe; Rum. Rusciuk; (not Ruščuk, Rushchuk, Rustchuk).

St. Gallen: Switzerland; Fr. St. Gall; Ital. S. Gallo.

St. Vincent, Cape: Portugal; conv. for Port. Cabo de São Vicente.

Salonika: pr. Saloníka: Greece; conv. for. Gr. Θεσσαλονίκη = Thessalonikē; Serb-Croat Солун, Solun; Bulg. Солунъ = Solun; Turk. سلانيك = Selanik; Fr. Salonique; Sp. Salónica; (not Saloniki, Salonica).

Saragossa: Spain; conv. for Sp. Zaragoza, pr. Tharagotha; Fr. Saragosse.

Sarajevo: pr. Saráyevo: S.H.S.; Serb Сарајево; Turk. بوسنه سراى = Bosna Serai; (not Serajevo).

Sătmar: Transylvania, Rumania; Mag. Szatmár-Németi.

Sava: riv.; Ital. and Croat; Serb Сава; Fr. Save; Ger. Sau; Mag. Száva, pr. Sávŏ.

Schleswig: pr. Shlezvikh: town and prov., Germany; (not Sleswick, Slesvig, but see Slesvig).

Scutari: pr. Skútari: Albania; conv. (Ital.) for Alb. Shkodra or Shkoder; Serb-Croat Скадар, Skadar; Turk. اشقودره = Ishqodra; (not Skutari, Skodra).

Sebenico: pr. Sebéniko: S.H.S.; conv. (Ital.) for Serb-Croat Шибеник, Šibenik, pr. Shibenik.

Semendria: S.H.S.; conv. (and Ger. and Rum.) for Serb-Croat Смедерево = Smederevo, pr. Sméderevo.

Semlin: S.H.S.; conv. (and Ger.) for Serb-Croat Земун, Zemun; Mag. Zimony, pr. Zimon'.

Sevastopol: pr. Syevastópol': Ukraine; Russ. Севастополь; Ukr. Севастопіль = Sevastopil'; (not Sebastopol).

Seville: Spain; conv. for Sp. Sevilla, pr. Sevilya; Fr. Séville.

Shavli: Lithuania; conv. (Russ. Шавли) for Lith. Šiauliai; Lett. Šauļi; Ger. Schaulen; Fr. Chavli.

S.H.S. : abbrev. for the Kingdom of the Serbs Croats and Slovenes ; Serb-Croat Краљевина Срба Хрвата и Словенаца, Kraljevina Srba Hrvata i Slovenaca, pr. Krályevina Serba Khérvata i Slovénatsa ; pop. Yugoslavia (*q.v.*).

Sibiu : Transylvania, Rumania ; Ger. Hermannstadt ; Mag. Nagyszeben, pr. Nod'seben.

Sighetul Marmariei : Transylvania, Rumania ; Slovak Marmaroš Sihot ; Mag. Máramarossziget.

Sighisoara : Transylvania, Rumania ; Mag. Segesvár, pr. Shégeshvār ; Ger. Schässburg.

Silistra : Rumania ; (not Silistria).

Sistova : pr. Sístŏva : Bulgaria ; conv. for Bulg. Свищовъ = Svishtov ; Rum. Şiştov, pr. Shishtov.

Skagerrak : Norway–Denmark ; (not Skager Rack).

Skaw, The : Denmark ; conv. for Dan. Skagen ; (not The Skagen).

Slesvig, Nord : Denmark ; (not Schleswig, Sleswick).

Sofia : pr. Sófia : Bulgaria ; conv. for Bulg. София = Sofiya ; form. Средецъ = Sredets ; (not Sophia).

Sombor : S.H.S. ; Serb Сомбор ; Mag. Zombor.

Spalato : pr. Spálătŏ : S.H.S. ; conv. (Ital.) for Serb-Croat Сплет, Spljet, pr. Splet in Serb, Splyet in Croat, Splĭt locally.

Speyer : pr. Shpaiyer : Germany ; Fr. Spire ; (not Speier, Spires).

Stanislau : Poland ; conv. (Ger.) for Pol. Stanisławów, pr. Staniswávuf ; Ukr. Станиславів = Stanislaviv ; (not Stanislav, Stanislaw).

Štip or **Shtip** : S.H.S. ; Serb Штип ; Turk. اشتيب = Ishtib ; (not Ishtip).

Strasbourg : Alsace, France ; Ger. Strassburg ; (not Strasburg).

Strumica or **Strumitsa** : pr. Strúmitsa : S.H.S. ; Bulg. and Serb Струмица ; Gr. Στρώμνιτζα = Stromnitza ; Turk. اوسترومجه = Ustrumja ; (not Strumnitza, Stroumdja).

Subotica or **Subotitsa** : pr. Súbotitsa : S.H.S. ; Serb Суботица ; Ger. Maria Theresiopel ; Mag. Szabadka.

Sylt : Germany ; Dan. Sild, pr. Sil ; (not Syllt).

Syracuse : Italy ; conv. (and Fr.) for Ital. Siracusa ; Gr. Συράκουσαι = Syrakousai, pr. Sirákuse.

Syros : pr. Siros : isld. and town, Greece ; Gr. Σύρος ; (not Syra).

Szeged : pr. Seged : Hungary ; Ger. Szegedin ; Serb-Croat Сегедин, Segedin ; Rum. Seghedin.

Tagus : riv., Spain–Portugal ; conv. for Sp. Tajo, pr. Taho ; Port. Tejo, pr. Tezho ; Fr. Tage.

Târgul Secuilor : pr. Tŏirgul Sekuĭlor : Transylvania, Rumania ; Mag. Kézdivásárhely.

Tavastehus : pr. Tavastehüs : Finland ; conv. (Swed.) for Finn. Hämeenlinna.

Temisoara : Transylvania, Rumania ; Mag. Temesvár ; Serb-Croat Темишвар, Temišvar.

Tisa: riv.; Croat, Slovak, Rum.; Serb Тиса; Mag. Tisza, pr. Tisa; Ger. Theiss, pr. Tais.

Tornio: Finland; Swed. Torneå, pr. Torneo.

Trier: Germany; Fr. Trèves; (not Treves).

Trieste: Italy; Ger. Triest; Serb-Croat Трст, Trst, pr. Terst.

Trondhjem: pr. Tronyem: Norway; Ger. Drontheim; (not Throndjem).

Tsarskoe Selo: pr. Tsárskŏyĕ Syeló: Petrograd, Russia; Russ. Царское Село.

Tukums: Latvia; Ger. Tuckum; Russ. Тукумъ = Tukkum; Lith. Tukumas.

Turin: Italy; conv. (and Fr. and Ger.) for Ital. Torino.

Turtucaia: Rumania; Bulg. Тутраканъ = Tutrakan; (not Turtukay, Toutrakan).

Uleåborg: pr. Üleobor': Finland; conv. (Swed.) for Finn. Oulu.

Uppsala: pr. *Ŭ*psălă (as Eng. *up*): Sweden; form. Upsala; Fr. Upsal.

Ushant: France; conv. for Fr. Ile d'Ouessant; Breton, Enez Eussa.

Užhorod: pr. Uzh-horot: Československ.; Mag. Ungvár.

Valga or **Valka**: Estonia–Latvia; Russ. Валкъ = Valk; Ger. Walk.

Valona: Albania; conv. (Ital.) for Alb. Vlore; Gr. Αὐλών = Avlon; Turk. آولونیه = Avloniya; (not Vallona, Avlona).

Västervik: Sweden; form. Vestervik; (not Westervik).

Veles: S.H.S.; Serb Велес; Turk. کوپریلی = Köprili, pr. Köprülü.

Venice: Italy; conv. for Ital. Venezia, pr. Venétsia; Fr. Venise; Ger. Venedig, pr. Venédikh.

Viborg: pr. Vibor' (almost Vibori): Finland; conv. (Swed.) for Finn. Viipuri or Wiipuri, pr. Vípuri.

Vidin: Bulgaria; Bulg. Видинъ; (not Widin, Widdin).

Vienna: Austria; conv. (and Ital.) for Ger. Wien; Fr. Vienne; Česky Vídeň, pr. Vĺden'; Pol. Wiedeń; Mag. Bécs, pr. Bech.

Vistula: riv., Poland–Germany; conv. for Pol. Wisła, pr. Viswa (nearly); Ger. Weichsel, pr. Vaixl; Russ. Висла = Visla.

Volos: Greece; Gr. Βόλος; (not Volo).

Warsaw: Poland; conv. for Pol. Warszawa, pr. Varsháva; Russ. Варшава = Varshava; Ger. Warschau; Fr. Varsovie.

Windau: pr. Vindau: Latvia; conv. (Ger.) for Lett. Ventspils; Lith. Ventpilis; Russ. Виндава = Vindava; (not Windawa).

Württemberg: Germany; (not Wurtemberg, Würtemburg).

Yannina: pr. Yánĭna: Epirus, Greece; conv. for Gr. Ἰωάννινα = Ioannina; Serb-Croat Јањина, Janina; Turk. یانیه = Yaniya.

Yugoslavia; pop. for S.H.S. (*q.v.*); conv. for Serb-Croat Југославија, Jugoslavija, pr. Yugoslaviya; Fr. Yougoslavie; Ger. Südslawien; (not Yougoslavia, Jugo-Slavia).

Zagreb: S.H.S.; Serb Загреб; Mag. Zágráb; Ger. Agram; Ital. Zagabria.

Zante: isld., Greece; conv. (Ital.) for Gr. Ζάκυνθος = Zakynthos.

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